



Winona Bridge Work Package #5

Bridge No. 5900 (Existing Bridge) Rehabilitation and Reconstruction

Q&A #2

Question:

MnDOT has listed a faster than planned deterioration of the bridge as one of the reasons for the cost increase. I have looked at the MnDOT bridge inspection reports and don't see the same thing. I feel I have a good understanding of these reports.

Answer:

From Jennifer Zink, MnDOT State Bridge Inspections Engineer

Attached are portions of the fracture critical inspection reports from 2008 to 2014, which give a comprehensive view of the increased deterioration of the bridge. As these reports in their entirety, are hundreds of pages long, only certain pages are attached due to file size.

In both the 2008 and 2010 inspections, note the highlighted portion of the NBI summary sections. They show an intermediate drop in the NBI rating for the Superstructure due to condition. An NBI rating below 4 requires immediate action. NBI ratings are only reported to the FHWA once per year typically in March. So as a result, by the time this is done, the NBI has been upgraded back to 4 or above by that time due to immediate action on the bridge.

Also note the change in element condition ratings from each year (located near the middle to end of each file). I've highlighted the elements mainly pertaining to the truss - both the deck trusses and main through truss spans. As with NBI ratings, element ratings can be upgraded to a certain point if any repair or deterioration mitigation efforts are made. I have also included the NBI historical condition summary of the bridge showing the changes over the years.

I'd like to stress the difference between inspection types - routine as opposed to fracture critical - so people can understand why there may not be a SIGNIFICANT change in the inspections from year to year. The definitions of these inspection types per the National Bridge Inspection Standards (NBIS) are as follows:

"Routine inspection: Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements."

"Fracture critical member inspection: A hands-on inspection of a fracture critical member or member components that may include visual and other nondestructive evaluation."

"Fracture critical member (FCM): A steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse."

"Hands-on: Inspection within arms-length of the component. Inspection uses visual techniques that may be supplemented by nondestructive testing."

In accordance with these definitions, a routine inspection is much less "in-depth", and usually does not include non-destructive testing techniques such as ultrasonic thickness measurements as is done with fracture critical inspections. Although significant change may not be reported in a specific year or inspection, that in itself is not indicative that there was no continued deterioration to some degree. The section loss element, for instance, provides percentages that can encompass a wide array of losses.

Condition State 2: Steel element has moderate section loss (from 2% to 5% of the total cross-section area). If the steel element has been recently repainted, any previously existing section loss is not severe enough to warrant structural analysis (less than 10% of the effective section).

Condition State 3: Steel element has significant section loss, but structural analysis is not yet warranted (section loss is less than 10% of the total cross-section area) or structural analysis has determined that the existing section loss has not significantly reduced the structural integrity of the element.

Condition State 4: Steel element has severe section loss (more than 10% of the total cross-section area). The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required.

Also, it is not uncommon for bridges to not show significant increased deterioration over a short 12 month period, especially when seasonal cycles are less severe than in past years in regards to snow and ice events. However, as with any bridge of this vintage, once moisture and salt is introduced to steel members, continued deterioration is inevitable and can grow exponentially as the bridge ages. Mitigation efforts such as painting, reinforcing, and/or caulking elements can slow down the process, but is only a temporary means.

I invite you to look at the Bridge Office inspection website for further information, especially in regards to our field inspection manual - Chapter B of the Minnesota Bridge and Structure Inspection Program Manual. The field manual defines the different NBI and element rating condition states. It also covers information on sufficiency ratings. The websites for MnDOT Bridge Inspection information and the manual are:

<http://www.dot.state.mn.us/bridge/inspection.html>

<http://www.dot.state.mn.us/bridge/pdf/insp/bridge-and-structure-inspection-program-manual.pdf>

If you have any further questions, please don't hesitate to contact me.

I. Findings Summary

This report documents the findings of the routine and fracture critical inspection of Mn/DOT Bridge No. 5900, TH 43 over the Mississippi River, Railroad and City Streets. **The inspection started on June 2, 2008 and was completed on June 5, 2008.**

A. SIGNIFICANT FINDINGS

Following is a summary of some of the more significant observations and recommendations:

1. During the in-depth fracture critical inspection of Bridge #5900 on June 2, 2008, a critical finding was observed by the Mn/DOT Bridge Office and District 6 inspectors (Appendix B). Numerous gusset plates located at the piers of the deck truss spans exhibited convex bulging distortion in the unbraced compression zones (i.e. at the end of the in-coming compression diagonal member). Significant section loss in most of these areas was also indicated by either 100% localized loss (a hole) or ultrasonic thickness testing measurements of up to 52% loss.

Recommendation: Repairs have been made (Appendix C). Continue to monitor all gusset areas for section loss and distortion during future inspections.

2. Ultrasonic thickness measurements were also performed on the horizontal and vertical shear zone locations at the interface of the gusset plates and the bottom chord. Up to 25% section loss of the gusset place was indicated in these locations.

Recommendation: Repairs have been made (Appendix C). Continue to monitor all gusset areas for section loss and distortion during future inspections.

3. A hazardous finding has also been observed in regards to the pedestrian sidewalk on the east truss side. The 2 inch concrete sidewalk is bowed upward significantly to the point where it is not even bearing on the steel beam supports. The inner steel support beams exhibit heavy corrosion as well. There is also sporadic concrete failure of up to 1inch, and the sidewalk chain link railing tilts outward away from the bridge at least 1 foot over the height of the railing. The railing post anchor bolts show signs of distress due to this out of plane bending.

Recommendation: Repairs have been made.

4. Several bearings exhibit paint loss and active corrosion. One through truss expansion bearing and four deck truss expansion bearings show no evidence of movement (See Bearing sections for further details).

Recommendation: Monitor corrosion during future inspections providing section loss measurements as needed. During future inspections, also measure the rotations on all expansion bearings to establish evidence of movement.

B. NBI CONDITION SUMMARY

While District 6 will have the final authority in determining the NBI and Pontis element condition ratings, the ratings recommended by the Mn/DOT Bridge Office are summarized below and in the attached Preliminary Report:

NBI Condition Ratings		
Item	Current	Suggested
Deck	6 (Satisfactory Condition)	6 (Satisfactory Condition)
Superstructure	5 (Fair Condition)	5 (Fair Condition)*
Substructure	6 (Satisfactory Condition)	6 (Satisfactory Condition)
Channel	8 (Very Good Condition)	6 (Satisfactory Condition)

- The deck is in satisfactory condition and should remain at 6 due to minor spalling.
- The superstructure is in fair condition and should remain at 5 due to the repairs performed on the gusset plates.

*The Preliminary Inspection Report (Appendix A), suggested an NBI condition rating of 3 due to the condition of the gusset plates PRIOR to the gusset repairs. This was entered by the District. Based on the repairs, this element level was changed to an NBI of 5 by the District.

- The substructure is in satisfactory condition and should remain at 6.
- The channel is in satisfactory condition and should be downgraded from an 8 to a 6 (see 2004 underwater report recommendations).

In-Depth Fracture Critical Bridge Inspection – Preliminary Summary (June 2008)

Bridge # 5900
 Location: Winona
 Bridge Owner: District 6
 Inspection Date(s): June 2, 3, 4, 5, 2008
 Lead Inspector(s): Jen Zink, Pete Wilson, Ken Rand, Bill Nelson, Eric Evens, Bob Pyfferoen
 Method of Access: UB 50, A-62, UB-30, Boom Van
 Traffic Control: District 6
 Scope of Inspection: Fracture Critical in-depth, special gusset

Critical Structural Deficiencies (Yes/No) Yes (see attached Critical Finding document)
 New Load Rating Recommended (Yes/No) Yes (load rating pending from consultant)
 Traffic Safety Hazard (Yes/No) No

NBI Condition Ratings			
Item	Current	Suggested	Comments
Deck	6	6	
Superstructure	5	3	Since the bridge is reopened to traffic due to a refined load ratings analysis, the condition of the gusset plates (i.e. severe section loss requiring corrective action) warrants a condition state 3.
Substructure	6	6	
Channel	8	6	See 2004 Underwater Report recommendations.

Suggested Pontis Element Condition Rating Changes ONLY							
#	Pontis Element Description	Quantity	Pontis Element Condition Ratings				
			1	2	3	4	5
303	Assembly Deck Joint	93 LF		93			
131	Painted Steel Deck Truss	1560 LF			340	860	360
387	Concrete Wingwall	2 EA		1	1		
409	Chain Link Fence	2289 LF				2289	
422	Painted Beam Ends	12 EA				12	

Pontis Smart Flags	Rating	Other Pontis Items	Rating
356 Steel Fatigue		981 Signing	NA-No signing required
357 Pack Rust		982 Approach Guardrail	
358 Deck Cracking	1	983 Plowstraps	
359 Underside of Concrete Deck		984 Deck & Roadway Drainage	
360 Settlement		985 Slopes & Slope Protection	
361 Scour		986 Curb & Sidewalk	
362 Traffic Impact		987 Roadway over Culvert	
363 Section Loss	5	988 Miscellaneous	
964 Critical Finding	2	Pontis Smart Flags & Other Items should be rated as "N" if they do not apply.	
965 Shear Cracking			
966 Fracture Critical	3		

2008 Element Notes to Add:

#303: 2 ¼" gap at Pier #20. Joint is noisy.

#131: Gussets at piers exhibit severe section loss in the unbraced compression area with through corrosion in most. Plate deformation in these areas is also present up to 7/16" bulging out.

#313: Pier 21 west bearing missing bolt in plate.

#387: NW wingwall has exposed rebar on top.

#361: See 2004 Underwater Inspection Report.

#363: See element #131.

#964: Critical Finding element notes added by Bridge Office (see attached corresponding photos): 6/2/08:

In-depth fracture critical inspection: Numerous gusset plates located at the piers of the deck truss spans only exhibited convex bulging distortion in the unbraced compression zones (i.e. at the end of the incoming compression diagonal member). Significant section loss in most of these areas was also indicated by either 100% section loss (a hole) or UT thickness measurements of up to 52% loss. UT measurements were also performed on the horizontal and vertical shear zone locations at the interface of the gusset plates and the bottom chord. Up to 45% section loss of the gusset plate was indicated in these locations. The sidewalk condition was also stated as a Hazardous Finding due to the sidewalk deck bowing upwards of 2" with areas of spalling underneath, the chain link fence bowing outward up to 12", and support beam deterioration and distortion.

#966: Gusset plate deterioration warrants CS 3. See element #131.

#409: Fence and posts are bowed outward significantly from 5" to 12" along entire length. Post connections to sidewalk are starting to exhibit distress.

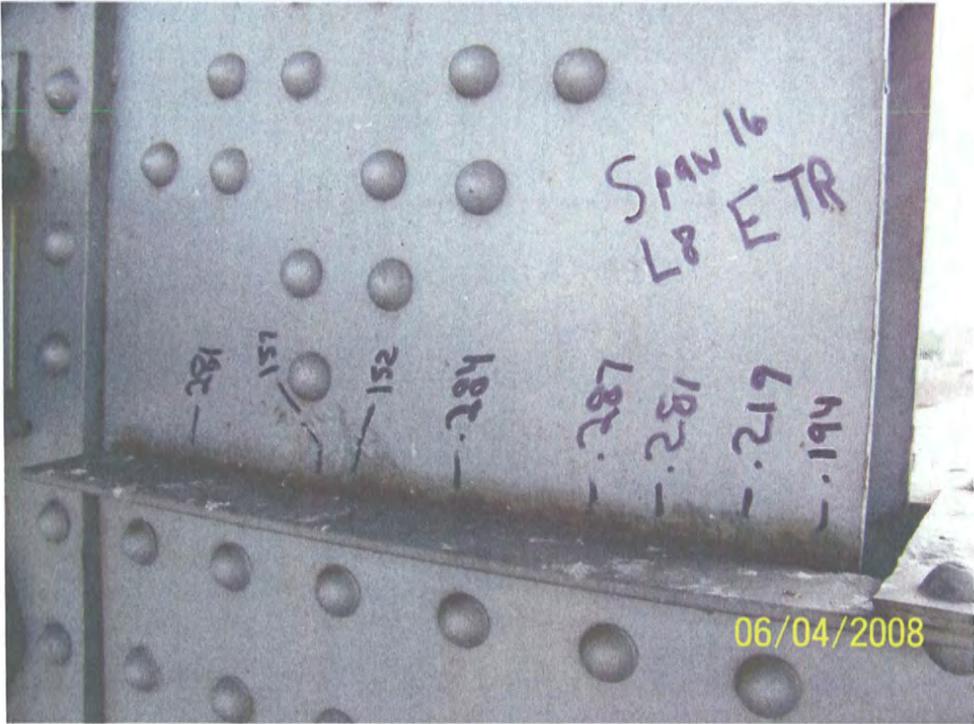
#422: Unsound paint is up to 40% in most areas.

Items to Review:

1. Check to see if horizontal hazard markers are required.
2. Add element #380 – Secondary Elements to rate the truss bracing.
3. Element #981 – Signing is in the inspection report, but the inventory states that no signs are required.
4. For element #422 – Painted Beam Ends: The quantity should correspond with the number of transverse deck joints above the steel superstructure. See updated Pontis Manual for further information.
5. Element notes should be more descriptive than "See attached snooper report". Most people don't have access to this attached snooper report.



Span 22 West Truss at Pier 21: Inside Gusset Through Corrosion



Span 16 East Truss Pier 16: Inside Gusset Ultrasonic Shear Zone Measurements



Sidewalk Looking South



Span 24 Outside Sidewalk Support Stringer Bend



Span 22 Chain Link Fence Bowed Outward 12 Inches

Bridge #5900 Critical Finding Written Notification

Bridge Location: MNTH 43 over the Mississippi River 2.8 miles north of the junction with Hwy 61

During the in-depth fracture critical inspection of Bridge #5900 on June 2, 2008, a critical finding was observed by the Mn/DOT Bridge Office and District 6 inspectors. Numerous gusset plates located at the piers of the deck truss spans only exhibited convex bulging distortion in the unbraced compression zones (i.e. at the end of the in-coming compression diagonal member). Significant section loss in most of these areas was also indicated by either 100% section loss (a hole) or ultrasonic thickness testing measurements of up to 52% loss.

Ultrasonic thickness measurements were also performed on the horizontal and vertical shear zone locations at the interface of the gusset plates and the bottom chord. Up to 25% section loss of the gusset place was indicated in these locations.

In accordance with Mn/DOT's Critical Finding Technical Memorandum No. 08-02-B-02, the Mn/DOT Bridge Office and District 6 was immediately notified. Photographic documentation of this critical finding was sent by e-mail to the Bridge Office both on 6/2/08 and 6/3/08.

Also in respect to the Technical Memorandum, a hazardous finding has also been observed in regards to the pedestrian sidewalk on the east truss side. The 2" concrete sidewalk is bowed upward significantly to the point where it is not even bearing on the steel beam supports. The inner steel support beams exhibit heavy corrosion as well. There is also sporadic concrete failure of up to 1", and the sidewalk chain link railing tilts outward away from the bridge at least 1 foot. The railing post anchor bolts show signs of distress due to this out of plane bending. Photographic documentation of the sidewalk condition will be forthcoming within the next 24 hours.

Jennifer L. Zink, P.E.
Bridge Inspection Engineer
Bridge #5900 Lead Inspector

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Jennifer L. Zink, P.E.
Bridge Inspection Engineer
Bridge #5900 Lead Inspector

Appendix C

Critical Findings Repair Documentation



Wiss, Janney, Elstner Associates, Inc.

330 Pfingsten Road Northbrook, Illinois 60062 847.272.7400 tel | 847.291.4813 fax www.wje.com

TRANSMITTAL

Via: E-mail

To: Gary Lovelace
Mark Anderson

From: Joe Rogers

Date: July 23, 2008

Project: Winona Bridge Gusset Plate
Repairs
WJE No. 2008.2462.1

Subject: As-built Drawings and Repair
Photos

Gentlemen-

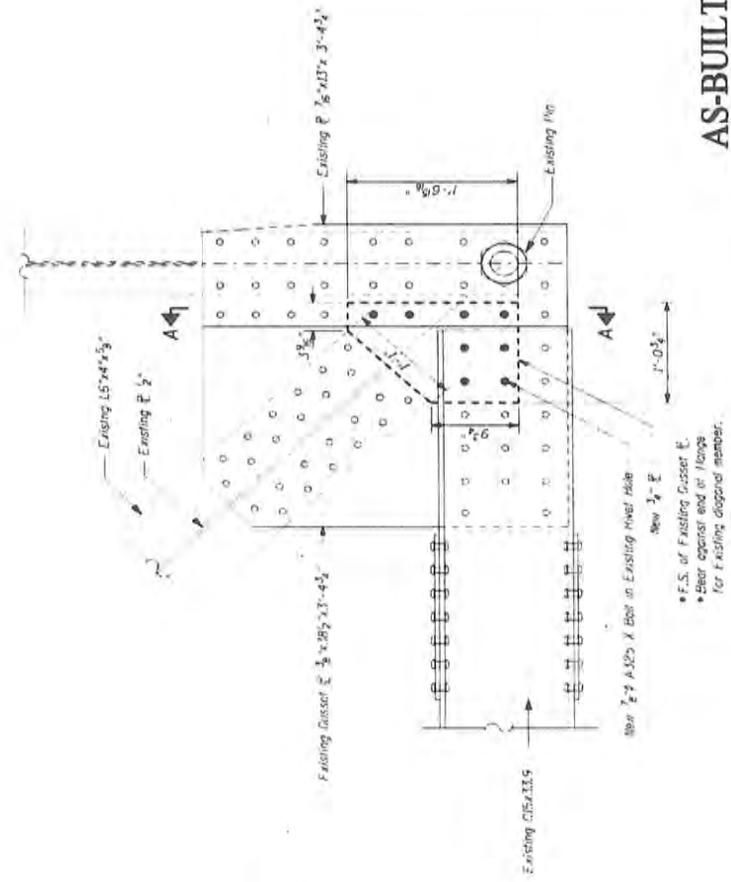
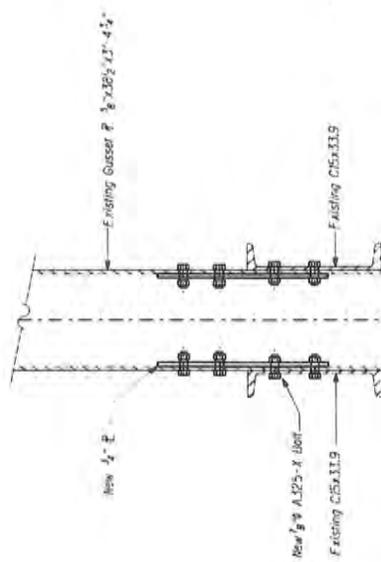
Attached find the As-Built drawings for the Winona Bridge gusset plate repairs. I have also included a photographic log of all the repair locations.

If there are any questions please let me know.

Thanks, Joe Rogers

Installation Procedure:

1. Fabricate new plate to dimensions shown, with no holes.
2. Remove the B rivets required for installation.
3. Place plate in position shown; grind bearing edge as required to provide bearing against flange of diagonal member.
4. With new plate in position shown, with bearing against flange of diagonal member provided; mark and drill holes for new bolts.
5. Install new bolts.



- F.S. of Existing Gussset E.
- Bear against end of Flange for Existing diagonal member.

SECTION A-A

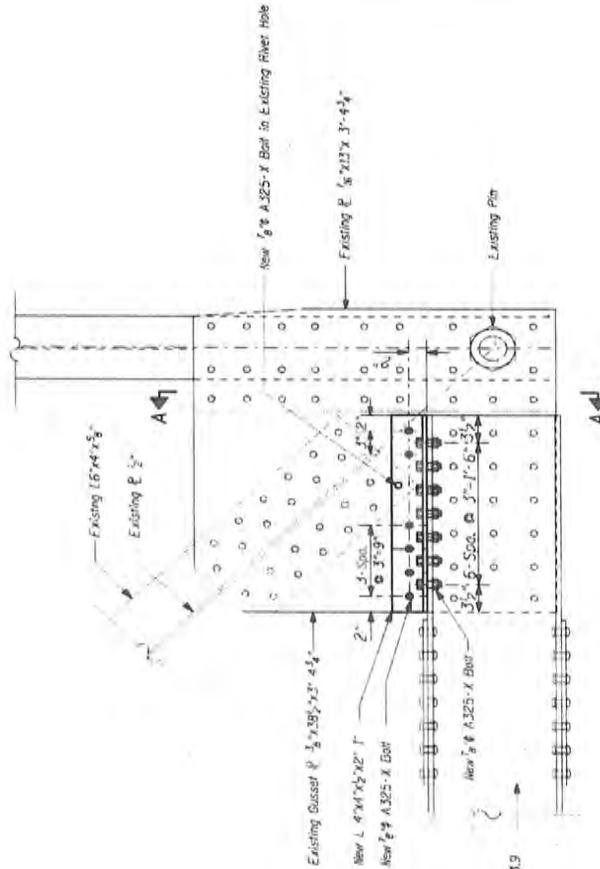
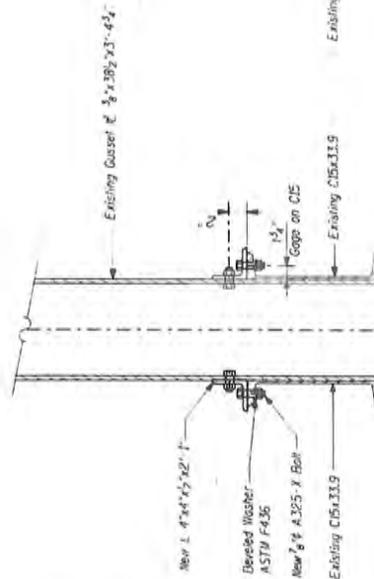
- CZ repair shown on both gusssets
- See Table on Sheet S-1 to see which gusssets require repair

AS-BUILT

WJE	Wills, Jannity, Eyster, Associates, Inc. Engineers, Architects, Mechanical Insulation 2200 Plymouth Road, Hutchinson, MN 55032 (612) 281-2800 Fax: (612) 281-4875
	STATE OF MINNESOTA PROFESSIONAL REGISTRATION DEPARTMENT OF TRANSPORTATION BRIDGE NO. 5900 7.4. 43 OVER MISSISSIPPI RIVER & 25 2.5 M. N. OF A.C. - JH. 61 ON WYOMING REPAIR OF L&E GUSSET PLATES
SCALE: 1/4" = 1'-0" DATE: JULY 14, 2008 FILE: 20080402	DRAWN BY: JAC CHECKED BY: JAC DESIGNED BY: JAC SHEET 5 OF 5

CZ REPAIR

- Installation Procedure:**
1. Fabricate new angle to dimensions shown, with 6 new bolt holes in vertical leg (do not drill hole for existing rivet location or any holes in horizontal leg).
 2. Remove interfering rivet.
 3. Drill holes in flange of existing C15 of locations and gage shown.
 4. Place angle in flange as shown and mark holes in existing gusset. Mark holes in horizontal leg of new angle; mark hole in vertical leg of new angle.
 5. Drill holes and insert angle.



SECTION A-A

- PCSZ-I repair shown on both gussets
- See note on sheet S-1 for see which gussets require repair.

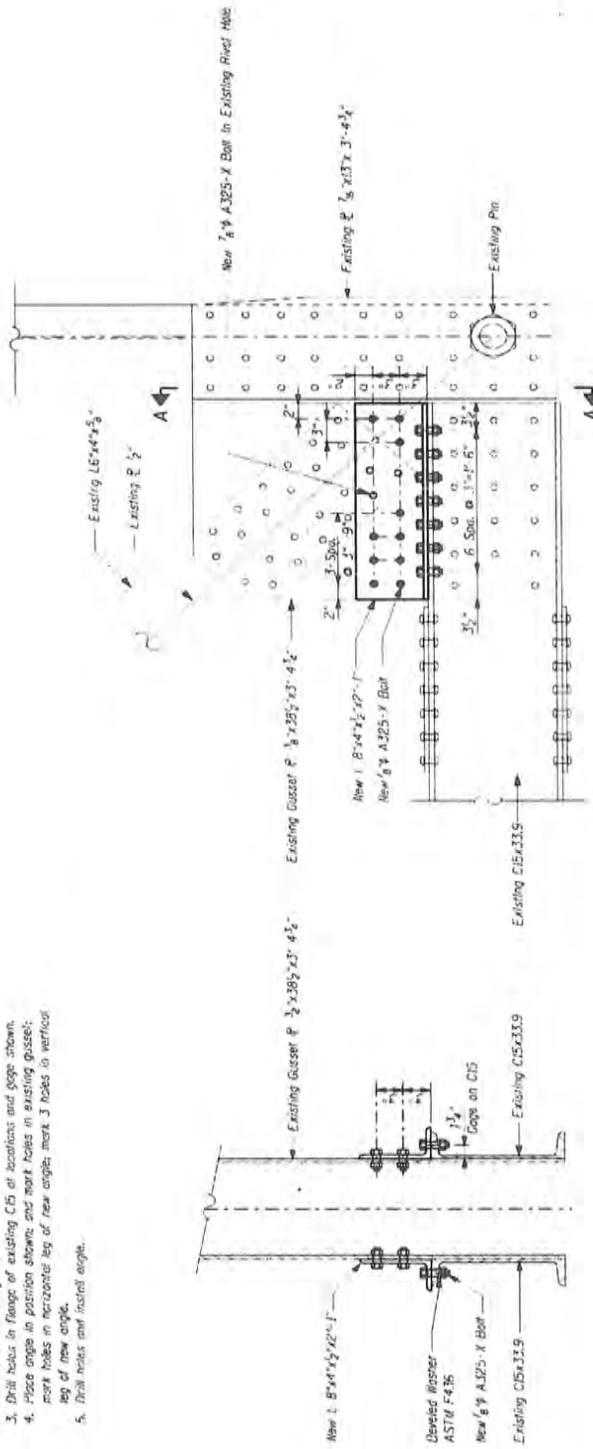
AS-BUILT

WJE	Wiss, Janney, Elstner Associates, Inc. 1050 Locust Street Suite 2000 St. Louis, MO 63102 Phone: (314) 241-2000 Fax: (314) 241-2001
	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION BRIDGE NO. 5900 OVER MISSISSIPPI RIVER & CS 2.5 MI. N. OF WISCONSIN, MN. & IOWA REPAIR OF 18 GUSSET PLATES SHEET NO. 11 OF 12 DRAWN BY: MJC CHECKED BY: MJC DATE: 11/20/08

PCSZ-I REPAIR

Installation Procedure:

1. Fabricate new angle in dimensions shown, with 10 new bolt holes. In vertical leg do not drill 3 holes for existing rivet locations or any holes in horizontal leg.
2. Remove 3 interfering rivets.
3. Drill holes in flange of existing C15 at locations and gage shown.
4. Place angle in position shown, and mark holes in existing gusset; mark holes in horizontal leg of new angle; mark 3 holes in vertical leg of new angle.
5. Drill holes and install angle.



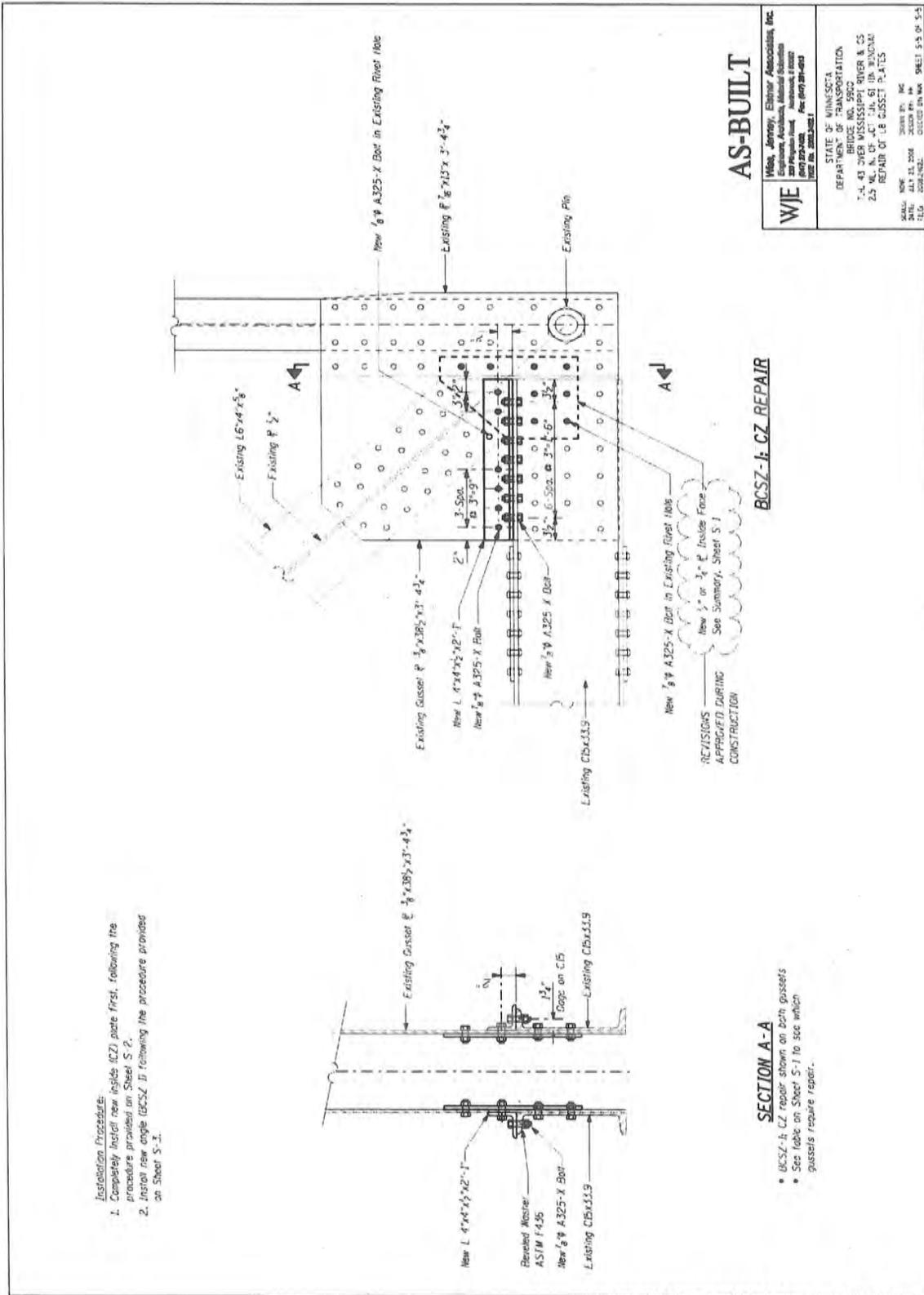
SECTION A-A

- DCSZ-2 repair shown on both gussets
- See table on Sheet S-1 to see which gussets require repair.

BCSZ-2 REPAIR

AS-BUILT

WJE	Welding, Inspection, Fabrication, Inc. 10000 Highway 100, Suite 100 Minnetonka, MN 55345 Tel: 763-853-8800 Fax: 763-853-8801 www.wje.com
	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION 215 W. A. C. P. 215 51 01 01 01 01 01 REPAIR OF 18 GUSSET PLATES DATE: 07/21/2008 DRAWN BY: JET CHECKED BY: JET DATE: 07/21/2008 PROJECT NO. MN SHEET 5-4 OF 2-5



Winona Bridge -Gusset Plate Repairs As-built Summary

Span	Pier	Truss	Plate	Repair	Photo ID
16	16	East	Inside	BCSZ-1	15
17	16	East	Inside	BCSZ-2	14
17	16	West	Inside	BCSZ-1	13
21	21	West	Inside	3/4 " -CZ	12
21	21	West	Outside	3/4 " -CZ	11
22	22	East	Outside	BCSZ-1; 1/2 " -CZ	8
22	22	East	Inside	BCSZ-1	7
22	21	West	Inside	3/4 " -CZ	10
22	21	West	Outside	3/4 " -CZ	9
23	22	East	Inside	BCSZ-1	6
23	23	East	Inside	BCSZ-1	4
23	22	West	Outside	BCSZ-1; 3/4 " -CZ	5
23	23	West	Outside	BCSZ-1; 3/4 " -CZ	3
24	23	East	Inside	BCSZ-1; 1/2 " -CZ	1
24	23	West	Inside	BCSZ-1; 1/2 " -CZ	2

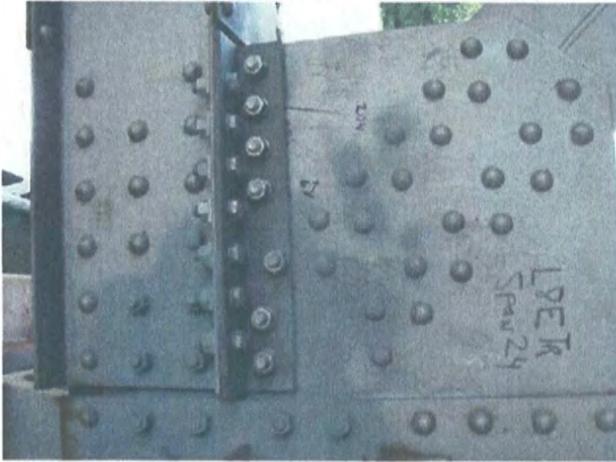


Photo 1.JPG



Photo 2.JPG



Photo 3.JPG



Photo 4.JPG

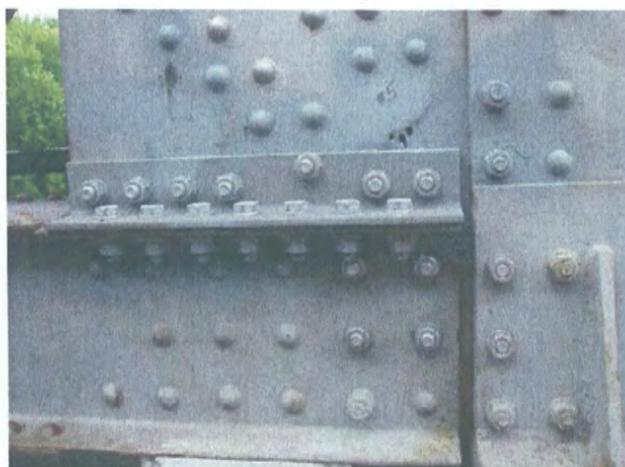


Photo 5.JPG



Photo 6.JPG

Mn/DOT Bridge No. 5900
Routine and Fracture Critical Bridge Inspection Report



Photo 7.JPG

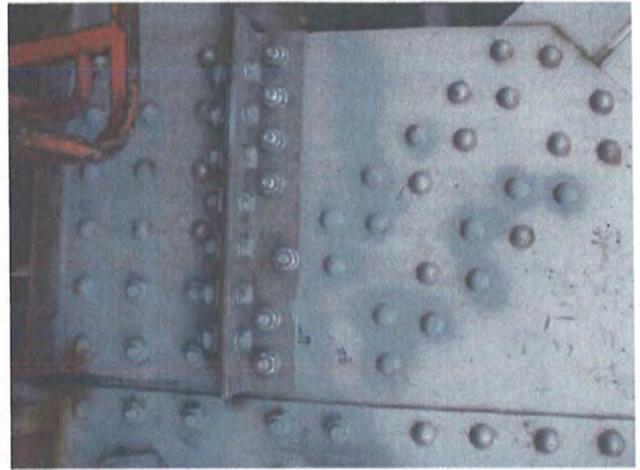


Photo 8.JPG

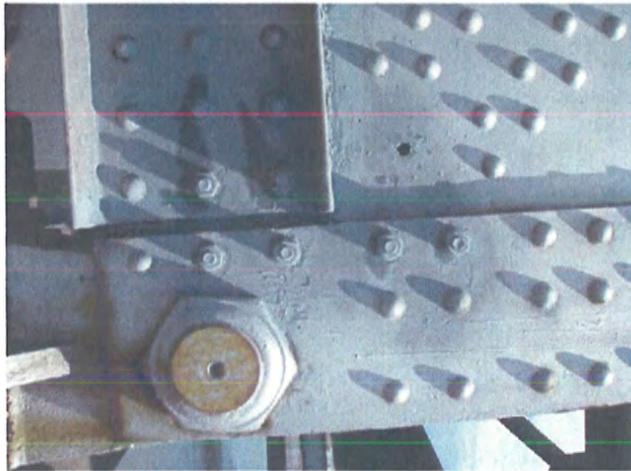


Photo 9.JPG

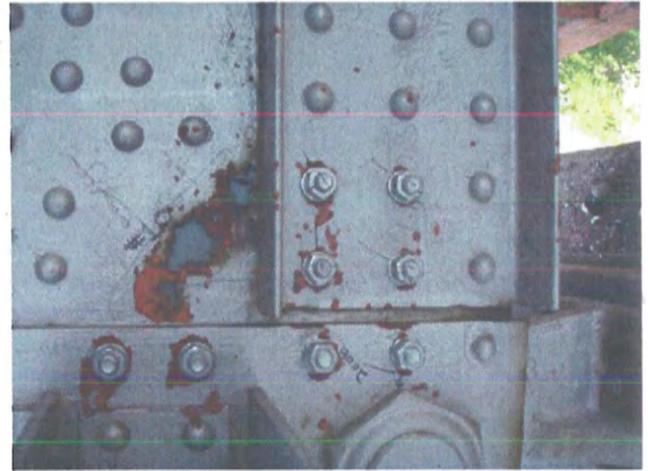


Photo 10.JPG



Photo 11.JPG



Photo 12.JPG

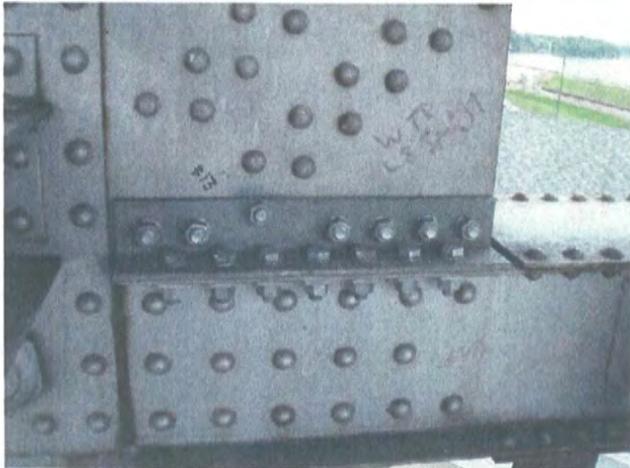


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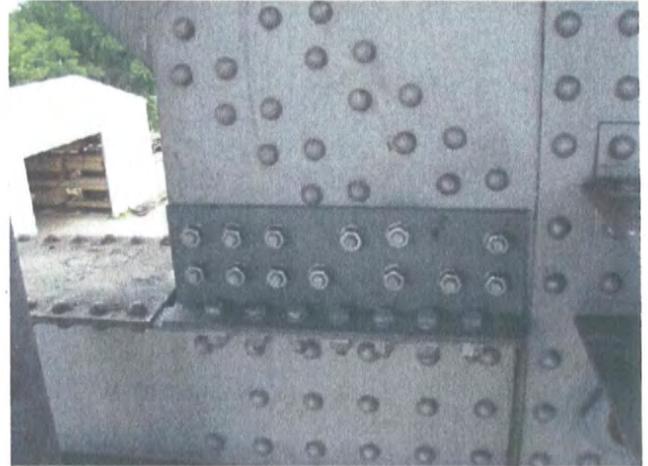


Photo 14.JPG

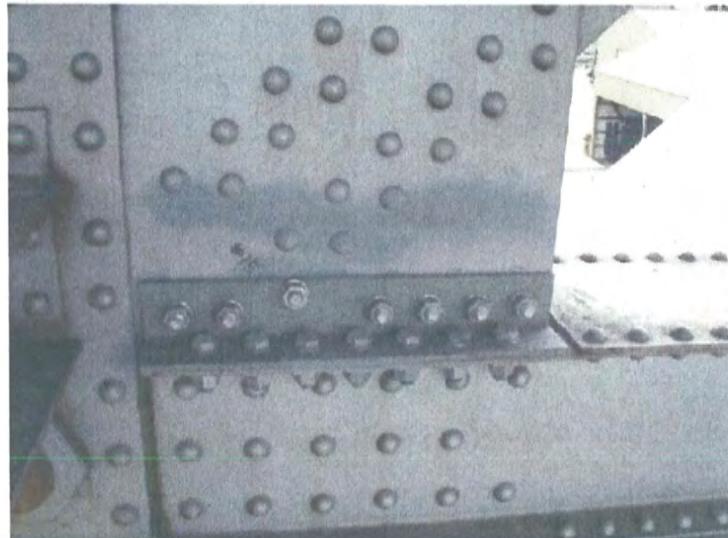


Photo 15.JPG

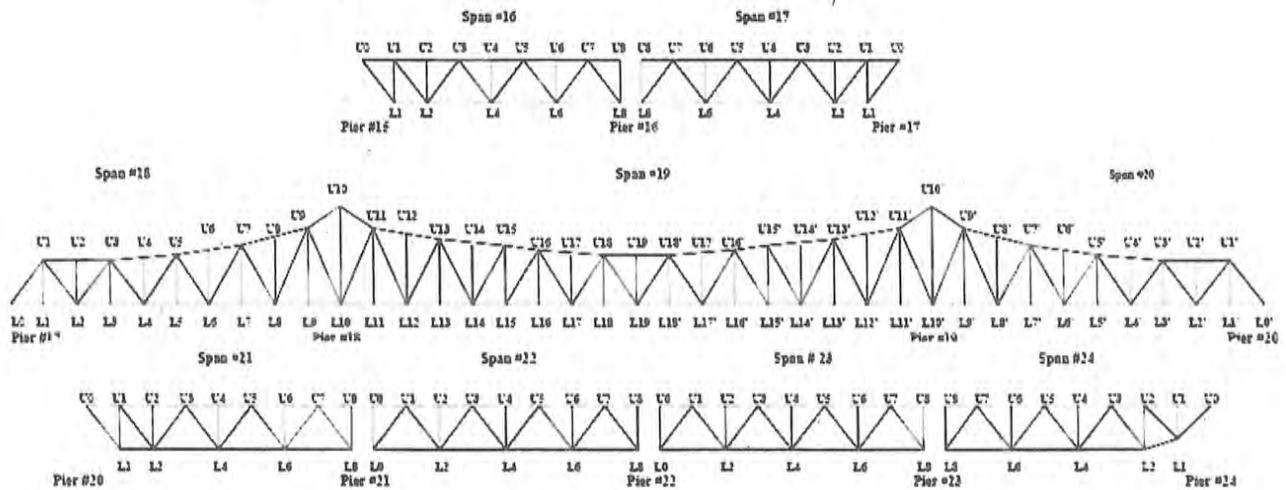
Appendix D Gusset Plate Summary



Mn/DOT Summary Report for Gusset Plate Inspection

Bridge # 5900 – Winona
Location: TH 43 over the Minnesota River
Bridge Owner: Mn/DOT
Inspection Date(s): 6/2/08 – 6/5/08
Lead Inspector(s): Jennifer Zink, Ken Rand, Bill Nelson, Pete Wilson, Eric Evens, Bob Pyfferoen
Method of Access: Reachall UB-50, A-62, UB-30 & Aerial Lift
Traffic Control: Lane Closures (both directions) provided by District 6 Bridge Crew

Scope of Inspection: This inspection included a close-up visual inspection of the main through truss and deck truss gusset plates deemed most critical according to the load rating reports. The gusset plates included in this inspection were U10, L15, U10', and L15' (Pictures 1-4) on the main through truss, and L0, U1, L2, L4, L6, U7, and L8 on the deck trusses. Ultrasonic thickness measurements were taken in locations where notable section loss was observed. Any out-of-plane distortion of the gusset plate edges and faces was indicated and measured with 3-foot to 6-foot straight edges. Due to severe section loss on the deck truss gussets located at the piers, a critical finding was reported (see Critical Findings Report). No problems were noted with the main through truss gussets except paint loss.



Summary of Findings: (See full Excel file at: S:\Inspection\03 Inspection Reports\01 MnDOT Bridges\District 6\D6-A Rochester\Br 5900 Winona\Reports\2008 (Fracture Critical - Gusset)

NP = No Problems Noted
 NC = Not Checked

Cells that contain a red triangle in the corner display a comment of deficiency location
 Highlighted panel point cells reflect the most notable problems in need of repair

Truss Span	Panel Point	Truss Side	Gusset Location	Section Loss % Along Horizontal Shear Area	Section Loss % Along Vertical Shear Area	Free Edge Deflection	Unbraced Compression Area Distortion	Max Pack Rust	
16	U3	E	In	NP	NP	1 1/2"	NP	NP	Picture 5
	L4	E	In/Out	NP	NP	NP	NP	NP	
	L8	E	In/Out	NP	NP	NP	NP	NP	
	U7	E	In/Out	NP	NP	NP	NP	NP	Picture 6
	L8	E	Out	NP	NP	NP	NP	1/4"	
	L8	E	In	35%	NC	NP	NP	5/8"	
	L4	W	In/Out	NP	NP	NP	NP	NP	
	L8	W	In/Out	NP	NP	NP	NP	3/16"	Picture 7
	U7	W	In/Out	NP	NP	NP	NP	NP	
	L8	W	Out	NP	NP	NP	NP	1/2"	
L5	W	In	NP	75%	NP	NP	3/16"		

Mn/DOT Bridge No. 5900
 Routine and Fracture Critical Bridge Inspection Report

17	L4	E	In/Out	NP	NP	NP	NP	NP		
	L6	E	In/Out	NP	NP	NP	NP	NP		
	U7	E	In/Out	NP	NP	NP	NP	NP		
	L8	E	Out	NP	NP	NP	1/2"	NP		
	L8	E	In	42%	NC	NP	1/2"	NP	Picture 8	
	L4	W	In/Out	NP	NP	NP	NP	1"		
	L6	W	In/Out	NP	NP	3/8"	NP	3/4"		
	U7	W	In/Out	NP	NP	NP	NP	NP		
	L8	W	Out	NP	NP	NP	1/4"	1/2"		
	L8	W	In	40%	NC	NP	1/2"	3/4"	Picture 9	
19	L14'	E	In	20%	NC	NC	NC	NC		
21	L4	E	In/Out	Yes	NP	NP	NP	1/2"		
	L6	E	In/Out	NP	NP	NP	NP	NP		
	U7	E	In/Out	NP	NP	1/8"	NP	NP		
	L8	E	Out	NC	NC	NP	1/8"	1"	Picture 10	
	L8	E	In	Hole between repair	NC	NP	1/4"	NP	Picture 11	
	L4	W	In/Out	Yes	NP	NP	NP	1/2"		
	L6	W	In/Out	Yes	NP	NP	NP	NP		
	U7	W	In/Out	NP	NP	1/16"	NP	NP		
	L8	W	Out	NC	8%	1/32"	7/16" Hole	<1/4"	Picture 12	
	L8	W	In	NC	20%	NP	Hole	<1/4"	Picture 13	
									Horizontal Vertical	
										1/8" 1/16"
										1/8" 3/32"
22	L0	E	In	NC	50%**	NP	1/8"	1/2"	Picture 14	
	L0	E	Out	NC	NP	NP	1/8"	NP		
	U1	E	In/Out	NP	NP	1/4"	NP	NP		
	L2	E	In/Out	NP	NP	NP	NP	NP		
	L4	E	In/Out	NP	NP	NP	NP	NP		
	L6	E	In/Out	NP	NP	NP	NP	NP		
	U7	E	In/Out	NP	NP	NP	NP	NP		
	L8	E	Out	NC	NC	5/32"	Hole	NP	Picture 15	
	L0	W	Out	NC	14%	NP	Hole	NP	Picture 16	
	L0	W	In	NC	16%	>1/8"	Hole	NP	Picture 17	
	U1	W	In/Out	NC	NC	1/8"	NP	NP		
	L2	W	In/Out	NP	NP	NP	NP	NP		
	L4	W	In/Out	NP	NP	NP	NP	NP		
	L6	W	In/Out	NP	NP	NP	NP	NP		
U7	W	In/Out	NP	NP	NP	NP	NP			
L8	W	Out	NC	NC	NP	1/8"	NP			
L8	W	In	NC	NC	NP	1/8"	NP			
	L0	E	Out	NP	NC	NP	NP	NP		
	L0	E	In	45%	NC	NP	NP	1/2"		
23	U1	E	In/Out	NP	NP	NP	NP	NP		
	L2	E	In/Out	NP	NP	NP	NP	NP		
	L4	E	In/Out	NP	NP	NP	NP	NP		
	L6	E	In/Out	NP	NP	NP	NP	NP		
	U7	E	In/Out	NP	NP	NP	NP	NP		
	L8	E	Out	NP	NC	NP	NP	NP		
	L8	E	In	44%	NP	NP	NP	1/2"	Picture 18	
	L0	W	Out	30%	NC	NP	3/16" Hole	NP		
	L0	W	In	NP	NC	NP	NP	NP		
	U1	W	In/Out	NP	NP	NP	NP	NP		
	L2	W	In/Out	NP	NP	NP	NP	NP		
	L4	W	In/Out	NP	NP	NP	NP	NP		
	L6	W	In/Out	NP	NP	NP	NP	1/2"		
	U7	W	In/Out	NP	NP	NP	NP	NP		
L8	W	Out	26%	NC	NP	3/16"	1/2"	Picture 19		
L8	W	In	NC	NC	NC	NC	NC			
24	L8	E	Out	NP	NC	NP	NP	NP	Picture 20	
	L8	E	In	20%	NC	FR	NP	7/16"		
	U7	E	In/Out	NP	NP	NP	NP	NP		
	L6	E	In/Out	NP	NP	NP	NP	NP		
	L4	E	In/Out	NP	NP	NP	NP	NP		
	L8	W	Out	NP	NP	NP	NP	NP		
	L8	W	In	21%	NC	NP	7/16"	NP	Picture 21	
	U7	W	In/Out	NP	NP	1/8"	NP	NP		
L6	W	In/Out	NP	NP	NP	NP	NP			
L4	W	In/Out	NP	NP	NP	NP	NP			

* 4/5" x 1.5" pitted area measuring a remaining section of 0.093 inches along vertical member on gusset
 **Section loss due to pit on inside of bottom chord at the interface of the inside gusset plate.



Picture 1: Span 19 East Truss U10
Inside Plate



Picture 2: Span 19 West Truss L15
Outside Plate



Picture 3: Span 19 East Truss U10'
Outside Plate



Picture 4: Span 19 East Truss L15'
Outside Plate



Picture 5: Span 16 East Truss U3 South Edge



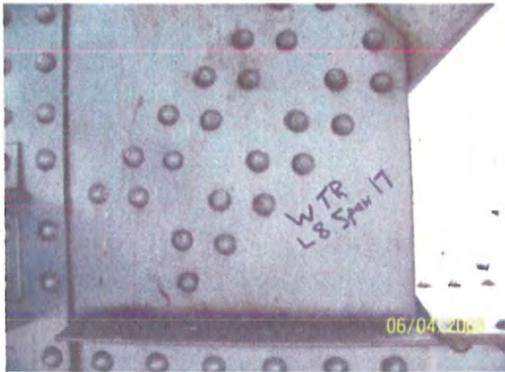
Picture 6: Span 16 East Truss L8
Inside Plate Shear Zone - 38% Loss



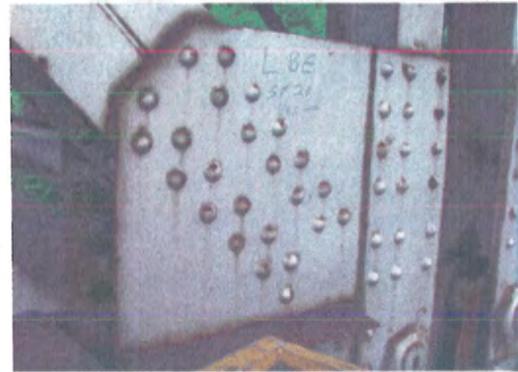
Picture 7: Span 16 West Truss L8
Inside Plate Localized Pit - 75% Loss



Picture 8: Span 17 East Truss L8
Inside Plate Shear Zone - 42% Loss



Picture 9: Span 17 West Truss L8 Inside
Plate Shear Zone - 40% Loss



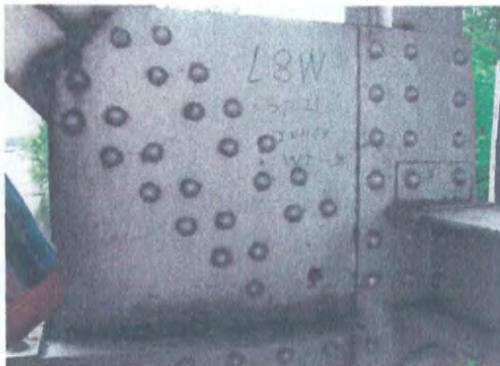
Picture 10: Span 21 East Truss L8
Outside Plate High Spot



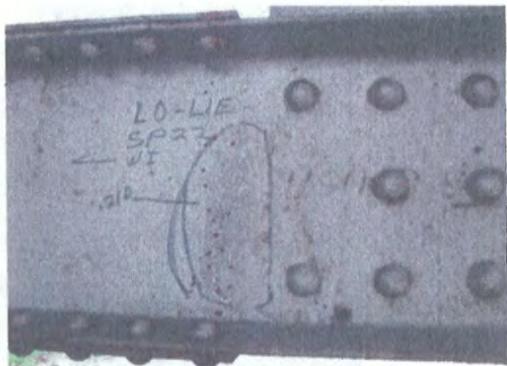
Picture 11: Span 21 East Truss L8 Inside
Plate Hole by Repair



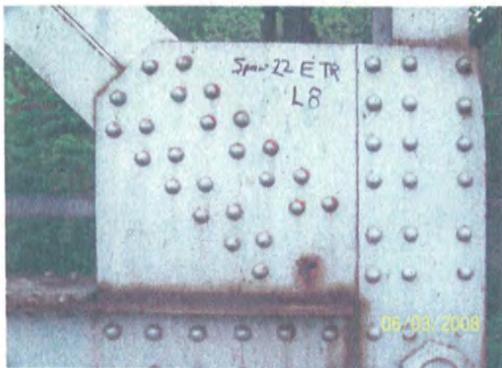
Picture 12: Span 21 West Truss L8 Outside
Plate Hole in Compression Zone



Picture 13: Span 21 West Truss L8 Inside Plate Hole



Picture 14: Span 22 East Truss L0 Inside Plate 50% Loss at Bottom Chord/Gusset Interface



Picture 15: Span 22 East Truss L8 Outside Plate Hole



Picture 16: Span 22 West Truss L0 Outside Plate Hole



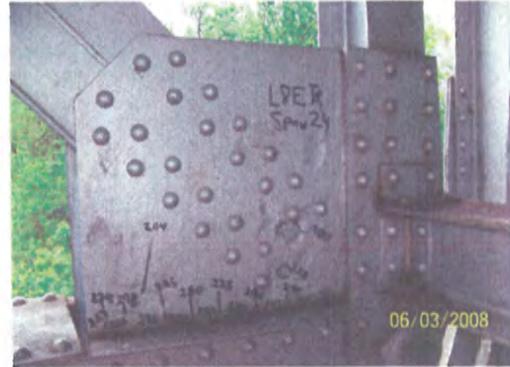
Picture 17: Span 22 West Truss L0 Inside Plate Hole



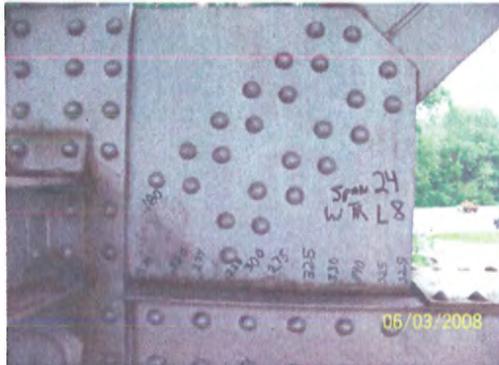
Picture 18: Span 23 East Truss L8 Inside Plate Shear Zone - 44% Loss



Picture 19: Span 23 West Truss L8 Outside
Plate Shear Zone – 26% Loss



Picture 20: Span 24 East Truss L8
Inside Plate Shear Zone – 29% Loss



Picture 21: Span 24 West Truss L8 Inside
Plate Shear Zone – 21% Loss

Buget Summary
 4.5" x 1.5"

Bridge 5900 Panel Point Deficiencies

NP = No Problems Noted

NC = Not Checked

Cells that contain a red triangle in the corner display a comment of deficiency location.

Highlighted panel point cells reflect the most notable problems in likely need of repair.

Truss Span	Panel Point	Truss Side	Gusset Location	Section Loss % Along Horizontal Shear Area	Section Loss % Along Vertical Shear Area	Free Edge Deflection	Unbraced Compression Area Distortion	Max Pack Rust	
16	U3	E	In	NP	NP	1 1/2"	NP	NP	
	L4	E	In/Out	NP	NP	NP	NP	NP	
	L6	E	In/Out	NP	NP	NP	NP	NP	
	U7	E	In/Out	NP	NP	NP	NP	NP	
	L8	E	Out	NP	NP	NP	NP	1/4"	
	L8	E	In	38%	NC	NP	NP	5/8"	
	L4	W	In/Out	NP	NP	NP	NP	NP	
	L6	W	In/Out	NP	NP	NP	NP	3/16"	
	U7	W	In/Out	NP	NP	NP	NP	NP	
17	L8	W	Out	NP	NP	NP	NP	1/2"	
	L8	W	In	75%*	NP	NP	NP	9/16"	
	L4	E	In/Out	NP	NP	NP	NP	NP	
	L6	E	In/Out	NP	NP	NP	NP	NP	
	U7	E	In/Out	NP	NP	NP	NP	NP	
	L8	E	Out	NP	NP	NP	1/2"	NP	
	L8	E	In	42%	NC	1/2"	NP	1/2"	
	L4	W	In/Out	NP	NP	NP	NP	1"	
	L6	W	In/Out	NP	NP	3/8"	NP	3/4"	
19	U7	W	In/Out	NP	NP	NP	NP	NP	
	L8	W	Out	NP	NP	NP	1/4"	1/2"	
	L8	W	In	40%	NC	NP	1/2"	3/4"	
	L14'	E	In	20%	NC	NC	NC	NC	
	21	L4	E	In/Out	Yes	NP	NP	NP	1/2"
		L6	E	In/Out	NP	NP	NP	NP	NP
		U7	E	In/Out	NP	NP	1/8"	NP	NP
		L8	E	Out	NC	NC	NP	1/8"	1"
		L8	E	In	Hole between repair	NC	NP	1/4"	NP
L4		W	In/Out	Yes	NP	NP	NP	1/2"	
L6		W	In/Out	Yes	NP	NP	NP	NP	
U7		W	In/Out	NP	NP	1/16"	NP	NP	
L8		W	Out	NC	8%	1/32"	7/16"-Hole	<1/4"	
3	L8	W	In	NC	20%	NP	Hole	<1/4"	
	L0	E	In	NC	50%**	NP	1/8"	1/2"	
	L0	E	Out	NC	NP	NP	1/8"	NP	
	U1	E	In/Out	NP	NP	1/4"	NP	NP	
	L2	E	In/Out	NP	NP	NP	NP	NP	
	L6	E	In/Out	NP	NP	NP	NP	NP	

OK?
 OK - NO Photos
 NO PHOTOS
 PHOTOS OK
 2. CB
 2. CB
 OK

Mn/DOT Bridge No. 5900
 Routine and Fracture Critical Bridge Inspection Report

22	U7	E	In/Out	NP	NP	NP	NP	NP	
	L8	E	Out	NC	NC	5/32"	Hole	NP	2 CS
	L5	E	In				Possible Hole		2 BCS
	L0	W	Out	NC	14%	NP	Hole	NP	2 CS
	L0	W	In	NC	16%	>1/8"	Hole	NP	1 CS
	U1	W	In/Out	NC	NC	1/8"	NP	NP	
	L2	W	In/Out	NP	NP	NP	NP	NP	
	L4	W	In/Out	NP	NP	NP	NP	NP	
	L6	W	In/Out	NP	NP	NP	NP	NP	
	U7	W	In/Out	NP	NP	NP	NP	NP	
	L8	W	Out	NC	NC	NP	1/8"	NP	NO PHOTOS TAKEN
	L8	W	In	NC	NC	NP	1/8"	NP	
23	L0	E	Out	NP	NC	NP	NP	NP	
	L0	E	In	45%	NC	NP	NP	1/2"	2
	U1	E	In/Out	NP	NP	NP	NP	NP	
	L2	E	In/Out	NP	NP	NP	NP	NP	
	L4	E	In/Out	NP	NP	NP	NP	NP	
	L6	E	In/Out	NP	NP	NP	NP	NP	
	U7	E	In/Out	NP	NP	NP	NP	NP	
	L8	E	Out	NP	NC	NP	NP	NP	
	L8	E	In	44%	NP	NP	NP	1/2"	1 BCS
	L0	W	Out	30%	NC	NP	3/16" - Hole	NP	
	L0	W	In	NP	NC	NP	NP	NP	
	U1	W	In/Out	NP	NP	NP	NP	NP	
	L2	W	In/Out	NP	NP	NP	NP	NP	
	L4	W	In/Out	NP	NP	NP	NP	NP	
	L6	W	In/Out	NP	NP	NP	NP	1/2"	
U7	W	In/Out	NP	NP	NP	NP	NP		
	L8	W	Out	26%	NC	NP	3/16"	1/2"	2
	L8	W	In	NC	NC	NC	NC	NC	
24	L8	E	Out	NP	NC	NP	NP	NP	
	L8	E	In	29%	NC	PR	NP	7/16"	2
	U7	E	In/Out	NP	NP	NP	NP	NP	
	L6	E	In/Out	NP	NP	NP	NP	NP	
	L4	E	In/Out	NP	NP	NP	NP	NP	
	L8	W	Out	NP	NP	NP	NP	NP	
	L8	W	In	21%	NC	NP	7/16"	NP	2
	U7	W	In/Out	NP	NP	1/8"	NP	NP	
L6	W	In/Out	NP	NP	NP	NP	NP		
L4	W	In/Out	NP	NP	NP	NP	NP		

* 4/5" x 1.5" pitted area measuring a remaining section of 0.093 inches along vertical member on gusset

**Section loss due to pit on inside of bottom chord at the interface of the inside gusset plate.

I. Findings Summary

This report documents the findings of the routine and fracture critical inspection of Mn/DOT Bridge No. 5900, TH 43 over the Mississippi River, Canadian Pacific Soo Railroad, W 2nd Street, W 3rd Street, and Old Duke Road. The inspection started on June 21, 2010 and was completed on June 25, 2010.

A. SIGNIFICANT FINDINGS

Following is a summary of some of the more significant observations and recommendations:

1. During a rehabilitation scoping visit on June 3, 2010 and the in-depth fracture critical inspection of Bridge #5900 on June 21-25, 2010, critical findings were observed by the Mn/DOT Bridge Office and District 6 inspectors (Appendix B). Five gusset plates located at the Piers 16, 21, and 22 of the deck truss spans exhibited convex bulging distortion in the unbraced compression zones (i.e. at the end of the in-coming compression diagonal member): Span 16 L8W (west) Exterior, Span 22 LOE (east) Exterior and Interior, Span 22 L8W Exterior and Interior. Significant section loss in these areas was also indicated by either localized through corrosion (a hole) or ultrasonic thickness testing measurements of 20-40% loss in the horizontal shear zones.

Recommendation: A posting of 40 tons was immediately implemented on June 3, 2010 (Appendix C). Repairs, including spot painting, were made to all critical locations and areas with lower rating factors that did not meet the 40 ton posting (Appendix F). If the District elects to remove the posting in the future, further analysis by the Bridge Office would be necessary – see list of possible future repair locations in Appendix F.

2. Weigh-in-Motion sensors were installed by Cy-Con Inc. in the pavement on the bridge on October 27, 2009 that collects traffic data including number, type, and weight of vehicles. The data shows that since the 40 ton posting implementation, more vehicles with a gross vehicle weight exceeding 40 tons cross the bridge now than before the posting was implemented (Appendix C). Higher volumes of overweight vehicles occur more during the months of September and October.

Recommendation: Initiate load posting enforcement as necessary.

3. Significant section loss, some through corrosion, and distortion was found on other numerous deck truss gusset and bottom chord locations. The Mn/DOT Bridge Office analyzed all locations and prioritized repair (Appendix F). Locations identified and not repaired due to acceptable load rating factors with the 40 ton posting, also specified as Priority 3, are noted in the deck truss inspection findings on pages 19-27 of this report and in Appendix F.

Recommendation: Continue to monitor all gusset and bottom chord areas, including repaired areas, for section loss and distortion during future inspections.

4. Wear of up to ½” on the pins at U15 and U15’ east and west were found on Span 19 (Photo 91) – these pins are designed to slide, so some wear is expected. These pins are 25” long and 5” in diameter. There was no wear evident on the rotating pins at the fixed end of the false member at U16 and U16’. Structural evaluation bridge engineers from the Mn/DOT Bridge Office viewed the pins on-site in July 2010 and believe they are structurally sufficient.

Recommendation: Continue to monitor for wear and movement in these locations and report to the Mn/DOT Bridge Office as needed for analysis.

5. Frozen deck truss rocker bearings were previously noted in past reports. As a result, strain gauges were placed at Span 16 L6-L8E, Span 17 L8-U7E, Span 17 U1-U0E, and Span 18 L0-L1E in 2009 to measure thermal stresses. The strain gauges will remain in place until the end of summer 2011. During this inspection, survey markers were also installed on each pier cap end of Piers 16 and 17 to verify any pier movement if bearings are frozen. Survey measurements have not been taken since installation of markers. Bearing movement was verified during this inspection at Pier 17 South, Pier 20 North, Pier 21 North East Truss, and Pier 23 North East Truss. Bearing movement could not be verified at other expansion locations.

Recommendation: Continue to monitor bearings for movement and report to the Mn/DOT Bridge Office as needed for analysis. Analysis acquired from the strain gauge readings on August 5, 2010 found that due to the strain noted by the gauges, the gusset plates at U7 in Spans 16, 17, 21, and 24 would exhibit compression induced buckling deficiency. As a result, the U7 gusset plates were stiffened as part of the 2010 repairs to prevent buckling.

6. The deck has extensive cracking, leaching with efflorescence, and numerous areas of under-deck delaminations (Photos 7-11).

Recommendation: During the gusset and bottom chord repairs in 2010, Mn/DOT District 6 bridge crew removed 750 square feet of under-deck delaminations throughout all spans ranging from ¼” to 2 ½” thick. Continue to monitor under-deck delamination during future inspections providing locations as applicable.

7. During a mussel survey inspection on September 13-14, 2010 as part of the rehabilitation study of the bridge, a large scour hole over 6 feet deep and 3 feet in radius was noted at Pier 20. The 2008 Underwater Inspection Report (Appendix D) stated at that time, the scour holes at Piers 20 and 21 were only 2 to 4 feet in depth and 6 to 8 feet in radius.

Recommendation: The State Bridge Hydraulics Engineer recommended to the District that the river piers could be rip-rapped or monitored to prevent further scour problems. However, the recommendation is dependent upon the future of this bridge – rehabilitation or replacement. If the bridge is to be replaced as scheduled in 2014, then monitoring is sufficient. The next underwater inspection is scheduled for 2012. Rehabilitation will require more long term measures such as rip-rap.

B. NBI CONDITION SUMMARY

While District 6 has the final authority in determining the NBI and Pontis element condition ratings, the ratings recommended by the Mn/DOT Bridge Office in the 2010 7 Day Fracture Critical Report were adopted by the District:

NBI Condition Ratings		
Item	2009	Current
Deck	6 (Satisfactory Condition)	5 (Fair Condition)
Superstructure	5 (Fair Condition)	4 (Poor Condition)*
Substructure	6 (Satisfactory Condition)	6 (Satisfactory Condition)
Channel	8 (Very Good Condition)	6 (Satisfactory Condition)

- The under-deck has extensive cracking, leaching, and areas of delamination.
- The superstructure is currently in poor condition due to deterioration of the bottom chord areas and the gusset plates. There is section loss over a range of 20-50% in critical areas. Some moveable bearings are potentially restricted. Repairs were performed on the gusset plates and other truss members as listed in Appendix F.

*The 7 Day Fracture Critical Report (Appendix A), suggested an NBI condition rating of 3 due to the condition of the gusset plates prior to the gusset repairs. This was entered by the District. Based on the repairs, this element level was changed to an NBI of 4 by the District.

- The substructure is in satisfactory condition and should remain at 6. This rating was raised from a 5 to a 6 in 1999 due to pier surface repairs in 1998.
- The channel is in satisfactory condition and has been downgraded from an 8 to a 6 due to the recommendation and exposed footings and scour depressions identified in the 2008 Underwater Inspection Report (Appendix D).

C. INVENTORY UPDATES

- The structure length was recommended in the 2010 7 Day Fracture Critical Report to change from 2,288.5 ft to 2,281.5 ft per the 1985 plans. This change has been made.
- The structure area was recommended in the 2010 7 Day Fracture Critical Report to change from 78,724 sq ft to 78,611 sq ft per the 1985 plans. This change has been made.
- The sidewalk width was recommended in the 2010 7 Day Fracture Critical Report to change from 4.5 ft to 5 ft per the 1985 plans. This change has been made for the left side. Only one sidewalk is present on this bridge.

- The approach alignment was recommended in the 2010 7 Day Fracture Critical Report to change from 8 to 6. The approach alignment at the Minnesota side requires a minor reduction in the operating speed (3-5 MPH for a typical vehicle using the roadway). TH 43 makes a 90 degree turn east requiring a substantial speed reduction, but the roadway approach from the bridge to this turn only requires a minor additional speed reduction as substantiated in the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges pp. 57-58. This change has been made.
- The combined changes to the NBI and Inventory ratings have reduced the bridge sufficiency rating from 39.7 to 26.3.

7 Day Fracture Critical Report (Report Date: 7/2/2010) – Revised 7/19/2010

Disclaimer: The condition ratings in this report are only suggested. It is the responsibility of the Bridge Owner to enter inspection data into Pontis.

Bridge # 5900

Location: TH 43 over Mississippi River – Winona, MN

Bridge Owner: Mn/DOT District 6

Inspection Date(s): 6/21/2010 – 6/25/2010

Lead Inspector(s): Jennifer Zink, Eric Evens, Bill Nelson, Farrell Potter, and Scott Theisen

Assistant Inspector(s): David Hedeem, Steve Miller, Ryan Rohne, and Ramon Riba

Method of Access: Two A-62 and One A-75 Under-Bridge Inspection Vehicles; 80 ft High Man-Lift

Traffic Control: Mn/DOT District 6A Lane Closure

Scope of Inspection: In-Depth Fracture-Critical and Routine

Critical Structural Deficiencies	<u>Yes*</u>	<u>Span 22 L8W and Span 21 L0E Gusset plates exhibit 20-40% section loss in the horizontal shear zone with evident compression zone distortion (see Critical Finding documentation starting on page 2).</u>
New Load Rating Recommended	<u>No</u>	<u>Bridge was rated on June 3, 2010 due to a critical finding to 40 tons. A new rating may be necessary if additional repairs are needed/made due to analysis.</u>
Traffic Safety Hazard	<u>Yes</u>	<u>There are numerous areas of underdeck delamination.</u>
Structural Analysis Recommended	<u>Yes</u>	<u>A number of deck truss bottom chord and gusset locations were analyzed to determine capacity. Analysis on inspection findings is in process (see Critical Finding documentation).</u>

*Critical finding was resolved as of July1, 2010 when all critical repairs were made by District 6.

Suggested NBI Condition Ratings			
Item	Current	Suggested	Comments
Deck	6	5	Extensive cracking, leaching, and areas of under-deck delamination.
Superstructure	5	3	Superstructure steel members have severe deterioration in both the main and deck truss spans. There is severe section loss over a range of 20-50% in critical areas. Many moveable bearings are severely restricted or completely frozen.
Substructure	6	6	
Channel	8	6	Exposed pier footings and scour depressions were identified during the 2008 underwater inspection.

Suggested Pontis Element Condition Rating Changes in RED							
#	Pontis Element Description	Quantity	Pontis Element Condition Ratings				
			1	2	3	4	5
22	LS Overlay-Uncoated Rebar	12,082 SF	0	12,082	0	0	0
26	Top of Conc Deck-Epx	64,106 SF	0	64,106	0	0	0
107	Painted Steel Girder	785 LF	325	360	100	0	0
109	P/S Concrete Girder	421 LF	417	4	0	0	
110	Concrete Girder	1,686 LF	1,430	239	17	0	
113	Paint Steel Stringer	12,593 LF	3,593	5,500	3,200	300	0
121	P/Stl Thru Truss/Bot	1,867 LF	0	0	1,400	467	0
126	P/Stl Thru Truss/Top	1,867 LF	0	700	1,040	127	0
131	Paint Stl Deck Truss	1,560 LF	0	0	650	900	10
152	Paint Stl Floorbeam	3315 LF	205	1,609	1,300	200	1
161	Pin & Hanger-Painted	12 EA	0	4	4	4	0
205	Concrete Column	49 EA	22	20	7	0	

210	Concrete Pier Wall	211 LF	111	89	11	0	
215	Concrete Abutment	79 LF	58	21	0	0	
234	Concrete Cap	840 LF	595	226	19	0	
300	Strip Seal Joint	372 LF	325	16	0		
301	Poured Deck Joint	1,085 LF	1,081	4	0		
303	Assembly Deck Joint	93 LF	0	93	0		
310	Elastomeric Bearing	35 EA	35	0	0		
311	Expansion Bearing	49 EA	28	21	0		
313	Fixed Bearing	37 EA	14	23	0		
321	Conc Approach Slab	2 EA	2	0	0	0	
334	Metal Rail-Coated	1867 LF	930	652	285	0	0
377	LS Overlay-Epx	2,423 SF	0	2,423	0	0	0
380	Secondary Elements	1 EA	0	1	0	0	
387	Concrete Wingwall	2 EA	0	2	0	0	
409	Chain Link Fence	3630 LF	3630	0	0	0	0
422	Painted Beam Ends	8 EA	4	2	2	0	0
423	Gusset Plate (Paint)	320 EA	60	120	105	0	35

Pontis Smart Flags	Rating	Other Pontis Items	Rating
356 Steel Fatigue	N	981 Signing	1
357 Pack Rust	3	982 Approach Guardrail	1
358 Deck Cracking	1	983 Plowstraps	N
359 Underside of Concrete Deck	3	984 Deck & Roadway Drainage	2
360 Settlement	1	985 Slopes & Slope Protection	2
361 Scour	1	986 Curb & Sidewalk	2
362 Traffic Impact	N	987 Roadway over Culvert	N
363 Section Loss	4	988 Miscellaneous	2
964 Critical Finding	1	Pontis Smart Flags & Other Items should be rated as "N" if they do not apply.	
965 Shear Cracking	N		
966 Fracture Critical	3		
967 Gusset Plate Distortion	4		

Pontis Rating Notes:

Element #22: Change quantity to match 1985 plan – 2” slump overlay added to Spans 3-14 of the existing deck that was not removed in the widening

Element #26: Change quantity to match 1985 plan – Spans 1-2, 15-24

Element #107: Quantity includes the 9 steel beams (W16x77) in Spans 1 and 2 and the 3 plate girders (84”x7/16”) in Span 15. Based on the District 6 Snooper Report and findings during this inspection, there is no steel that exhibits CS 4, and only a minor amount in CS 3. There is no extensive deterioration or section loss in these spans.

Element #109: Girder comprised of 1 (40-50), 2 (40-49), 6 (28-30), and 3 (28-32) beams.

Element #110: Change quantity to match 1940 plan of 4 girders at 421.5 ft each.

Element #113: Change quantity to include 5 stringers at 90’2.5” each in Span 15 (16 WF40) – the webs are encased in concrete, 6 stringers at a length of 779.36’ in Spans 16-17,21-24 (16 WF36), and 8 stringers at 933’3” in Spans 18-20 (21 WF59/62).

Element #121: Change quantity to include two truss bottom chords at 933’3”.

Element #126: Change quantity to include two truss top chords at 933.3”.

Element #131: Pack rust, paint failure, and surface corrosion have advanced between lacing and batten plates, chords, verticals, and diagonals – especially those elements below or near deck drains that were not extended prior to 2008-2009. Severe corrosion along bottom chord areas in multiple locations requires analysis (see table pp. 6-7). Mn/DOT Bridge Office is currently analyzing these locations.

Element #152: Change quantity to match 1985 plan. 82% web loss measured at Span 19 FB11’W at the stringer connection. Mn/DOT Bridge will analyze this and recommend a repair.

Element #161: Pins at U15 and U15' on both trusses exhibit extensive wear of up to 1/2". Although not of immediate concern, the Mn/DOT Bridge Office Structural Evaluation Unit will analyze within the next few months. UT was performed on all pins in 2010.

Element #210: Change quantity to match 1985 plan.

Element #215: Change quantity to match 1985 plan.

Element #300: Strip seal joints at Piers 2, 5, 8, 11, 14, 15, 16, 19, 21, 22, 23, and North Abutment (12x31ft) – installed in 1985. 6 feet of gland pulled out at Pier 5, 2 ft at Pier 8, 2 feet at Pier 11, 2 ft at Pier 15, 1 ft at Pier 16, and 1 ft at North Abutment. 2 foot patched area at Pier 22. Opening measurements will be reported in the FC Report.

Element #301: Change quantity to match 1985 plan: 35 joints on main truss only x 31' roadway surface.

Element #303: Assembly joint at Piers 17, 18, and 20 (3x31ft) – installed in 1985. All joints have active corrosion. Pier 18 joint has possible leak at east end. Opening measurements will be reported in the FC Report.

Element #310: Elastomeric bearings were put on the approach spans for the multi-beams in Span 2 in 1985, under the new pre-stressed girder at the east fascia in Spans 3-14 in 1985, and the deck truss at Pier 22 North in 2005. Bearings behaving as intended.

Element #311: There are 3 total expansion bearings on Pier 15 South for the 3 plate girders and 4 total rocker link anchorage bearings – 2 at Pier 17 North and 2 at Pier 20 South. Other expansion bearings are on the main truss at Piers 18 and 19, the rocker bearings on the deck truss spans, and bituminous felt bearings under the original 4 concrete girders in approach Spans 3-14.

Element #313: Change quantity to match 1940/1985 plans.

Element #334: Change quantity to only reflect metal coated railing on Spans 18-20 (933'3" x 2 sides). There is now a new element to reflect the chain link fence.

Element #357: Pack rust in deck truss bottom chord between built up channels and plates exhibit up to 1". Deck truss gusset plate horizontal surface exhibit up to 3/4" pack rust. Connections are still intact.

Element #359: Numerous areas of delamination present; mainly at the fascia and center. Total delamination has increased from less than 2% to well over 2% of total deck area. Leaching is present continuously every 5 feet.

Element #360: Strain gauges set at Piers 16 and 17 indicate some stress due to fixity. This may be due to frozen bearings. As such, pier movement may be allowing the bridge to expand and contract. Survey markers were set on Piers 16 and 17 June 24, 2010 to monitor pier movement.

Element #363: Section loss has advanced since the 2008 FC inspection. A number of areas exhibit severe section loss in critical areas. Span 22 L8W and Span 21 L0E section loss triggered a critical finding. A number of other areas have been or are currently under analysis by the Mn/DOT Bridge Office to determine capacity (see table pp. 6-7).

Element #377: Change quantity to match 1985 plans – widened 5'9" portion of Spans 3-14.

Element #380: Add this element to account for truss portal and sway bracing, lateral bracing and diaphragms. There is only minor to moderate deterioration overall. Minor steel paint failure and concrete cracking present.

Element #409: New Element. Chain link fence is present along the entire new timber sidewalk for the total structure length of 2,282 ft. Chain link fence also present on all spans except Spans 18-20.

Element #422: Update quantity to correspond with the number of transverse deck joints (typically expansion joints) on the portion of the bridge with a steel superstructure.

Element #423: Change quantity to 320 (160 total per truss). 35 locations have severe or critical deterioration due to paint failure, section loss, and/or distortion (see table pp. 6-7). These locations are under review by the Mn/DOT Bridge Office. All other lower gusset plates have moderate deterioration – failed paint and surface corrosion. Upper panel points typically have moderate paint deterioration with some not evident of deterioration at all.

Element #964: Span 22 L8W and Span 21 L0E gusset plates exhibit 20-40% section loss in horizontal shear zone with evident compression zone distortion. Analysis determines that the load rating factor is less than

1.0. Immediate repairs are necessary. Plans were provided to the District by the Mn/DOT Bridge Office. Repairs completed 7/1/2010.

Element #966: See Element #964 notes. A number of deck truss bottom chord and gusset locations also require additional analysis to determine capacity. Mn/DOT Bridge Office is currently analyzing these locations.

Element #967: Span 22 U1E north free edge exhibits ½” distortion not due to pack rust or fit-up. This has increased from the 1/8”-1/4” reported in 2008. Mn/DOT Bridge Office is currently analyzing this location. Other areas of distortion exist along free edges due to significant pack rust and/or fit-up. A number of compression zone areas are distorted outward on deck truss gusset plates (see table pp. 6-7).

Element #985: The north abutment slope is breaking away or eroding near the roadway below due to the drainage coming off of the east side of the abutment.

Inventory Item Notes:

Structure Length – Change length from 2,288.5 ft to 2,281.5 per the 1985 plans.

Structure Area – Change area from 78,724 sq ft to 78,611 sq ft per the 1985 plans.

Sidewalk Width – Change length from 4.5 ft to 5 ft per the 1985 plans.

Approach Alignment – Change **the current rating of 8 to the new rating of 6**. The approach alignment at the Minnesota side requires a minor reduction in the operating speed (3-5 MPH for a typical vehicle using the roadway). TH 43 makes a 90 degree turn east requiring a substantial speed reduction, but the roadway approach from the bridge to this turn only requires a minor additional speed reduction as substantiated in the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges pp. 57-58.

Critical Finding Documentation:

During the fracture critical and routine inspection June 21-25, 2010 at Bridge 5900, the following finding initiated a critical finding per Mn/DOT Technical Memorandum 08-02-B-02:

Span 22 - L8W Gussets: - these plates are 3/8” thick nominal

- Exterior Gusset (Photo 1): 40% loss measured on the horizontal shear zone. There is also a 1/8” bulge out in the compression zone.
- Interior Gusset (Photo 2): 30% loss measured on the horizontal shear zone. There is also a 1/8” bulge out in the compression zone and 3/8” bow out on the vertical free edge.

Span 21 – L0E Gussets: - Due to the July 4th weekend, pedestrian loads were addressed in the continued analysis. As a result of pedestrian loads on the east truss, this nodes falls under critical status.

- Exterior Gusset (Photo 3): 20% loss measured in the horizontal shear zone. 37% loss measured in the compression zone at the end of the diagonal.
- Interior Gusset (Photo 4): No notable loss in the horizontal shear zone. 30% loss measured in the compression zone at the end of the diagonal.

Yihong Gao – Load Ratings – was contacted onsite by Jennifer Zink via e-mail and performed a detailed analysis on the finding. Span 22 L8W gussets do not meet the load calculations for the less conservative, refined method of computing gusset plate capacity. The rating factor computes at 0.96. This is the most critical node identified during the inspection due to the distortion in the compression zone and section loss in the horizontal shear zone.

As a result of the analysis, the Bridge Office and District personnel did not feel it was necessary to close the bridge but felt that it was prudent and necessary to begin the work as soon as possible. Tuesday was the soonest that the bridge crew could gather materials and equipment to perform this work. The bridge could maintain the current posting of 40 tons through the weekend with repairs to commence June 29, 2010.

Another area discussed to be repaired includes Span 23 L8E exterior plate. Since the District has the use of 2 snooters throughout the week of June 29, 2010, all notable L0/L8 panel points were analyzed with pedestrian loading added on the east truss. Other potential areas of repair are to be discussed over the next week and prioritized. A list was tabulated by Jennifer Zink of notable deficient locations (see pages 6-7). The Bridge Office will analyze and prioritize all locations for preventative actions. Applicable photos are located at:

<\\ad\bridge\Inspection\District 6\5900 Repairs>

The NBI superstructure rating has been adjusted to 2 by the Mn/DOT Bridge Office based on the needed gusset repair. It will be re-adjusted to a 3 once repairs are made to the gusset plates.



Photo 1: Span 22 L8W Exterior Gusset



Photo 2: Span 22 L8W Interior Gusset



Photo 3: Span 21 L0E Exterior Gusset Plate



Photo 4: Span 21 L0E Interior Gusset Plate

Span	Location	Issue Noted	Photo #	Previous Fix?
16	L4W	Outside plate North Horizontal Shear Zone loss - 27%; Outside plate South Shear Zone localized loss of 34%; Inside plate localized loss at vertical - 15%	1-2	
16	L6W	Outside plate North Horizontal Shear Zone loss - 25%; Outside plate South Shear Zone - no loss ; Inside plate no loss	3-4	
16	L8W	Outside plate - 1/8"-1/4" bulge in compression zone with 1/2" diameter hole in same location found in 2009 inspection. 34% loss measured in the compression zone and 36% loss measure along the horizontal shear zone. Inside plate - 75% localized loss in an area of 4.5" x 1.5" along the vertical 14" down from top of gusset. Localized horizontal shear loss of 26% for 2" from free edge.	5-6	Outside Plate Fixed June 2010
17	L2W Out	Outside plate - Horizontal shear zone loss 20% overall, 16% loss along north diagonal, Top free edges bowed out 1/4", South side free edge bowed out 3/16"	7	
17	L2W In	Inside plate - Horizontal shear zone loss 20% south side only, 33% localized loss on south side at vertical	8	
17	L4E Out	Outside plate - North compression zone loss 28%, South Compression zone loss 25%, Horizontal shear zone loss 16%	9	
17	L8E Out	Outside plate - 15% loss horizontal shear zone, 26% loss compression zone, 43% loss at vertical just above diagonal	10-13	Inside plate fixed
17	L8W Out	Outside plate - 23% loss horizontal shear zone, 16% loss compression zone; Inside plate - fixed but vertical edge bow out 1/4"	14-15	Inside plate fixed
19	Stringer 1 at FB18 N	56% loss where stringer meets floorbeam connection	16	
19	FB11' W	FB web loss at stringer connection - isolated north side 70% loss, isolated south side 82% loss	17-20	
19	Pins at U15 and U15' E & W	Wear of up to 1/2" on pin. Pin is 25" long and 5" in diameter. Pins at U16 and U16' have no wear.	20a	
21	L2W	Outside plate - Hole >2" now that was reported in 2009 as 1-1/4". Loss along horizontal shear zone above bottom chord is 10% overall and 20% on just the south portion. Inside plate - Localized horizontal shear zone loss of 33%	21-22	Analyzed, but not critical for 40 ton posting
21	L4W	Outside plate - South horizontal shear zone loss of 25%. Inside plate - Horizontal shear zone loss about 50% overall with 3/4" through corrosion on north side	23-27	Analyzed, but not critical for 40 ton posting
21	L4E	Outside plate - 27% loss in the horizontal shear zone noted in 2009; Inside plate - South portion has 60% loss in the horizontal shear zone, north portion has no substantial loss	28-30	Analyzed, but not critical for 40 ton posting
21	L6W	Inside plate - North horizontal shear zone loss 25% overall	31	
21	L8W	Outside plate - Horizontal shear zone loss of 33%; Inside plate - Horizontal shear zone loss 20% (avg=26.5%)	32-34	Comp. Zone Inside/Outside plate
21	L8E	Outside plate - Horizontal shear zone loss of 20%, Compression zone loss of 33%; Inside plate - fixed in 2000	35-36	
22	L0E Out	Horizontal Shear Zone loss - 20%; Compression zone loss - 37%	37-38	done
22	L0E In	Horizontal Shear Zone no notable loss; Compression zone loss - 30%	39-40	done
22	L0L2E	BC loss at gusset interface interior channel at 43% loss	38, 40	
22	U1E In/Out	Outside plate bottom south free edge 3/16" bow out; Inside plate vertical north free edge 1/2" bow out - not due to pack rust or fit up	41-47	
22	U5W In South	1/8" bend in near top chord	48	
22	L4E	Inside Plate - South horizontal shear zone loss 10%	49	
22	L4-L6E	Inside channel corrosion south of L4E	50-54	
22	L8E Out	5/16" vertical free edge distortion; 1/8" bulge out in compression zone	55-56	Yes
22	L8W Out	Horizontal Shear Zone Loss - 40%; 1/8" bulge out in compression zone	57-58	

22	L8W In	Horizontal Shear Zone Loss - 30%; 3/8" bow out on vertical free edge	59-60	
22	Bottom Chord near L8W	10% Web loss outside channel; 40% web loss inside channel	61-65	
23	L0 E Out	5/8" bulge out in compression zone with 25% loss; 27% loss in horizontal shear zone	66-71	L0E In Fixed
23	Bottom Chord near L0E	50% Web loss inside channel - with hole; 30% web loss outside channel; about 30% loss all flanges	72-76	
23	Bottom Chord near L4E	18" south of L4E for 80" - Loss of section; 3/8" web plate 50% gone with areas of through corrosion; overall with channel intact is a loss of 25-30% overall	77-90	
23	L0W In	1/4" bulge out in compression zone; 25% loss in horizontal shear zone	91-97	L0W Out Fixed
23	L2E Out	Horizontal Shear Zone Loss - 30%	98	
23	L2W Out	1" diameter through corrosion along with 25% overall loss in horizontal shear zone	99-102	
23	L6W Out	Horizontal Shear Zone Loss - 20%	103-104	
23	Bottom Chord near L8W Out	18% Web loss outside channel	105-106	
23	L6E Out	Horizontal Shear Zone Loss - 14%	107	
23	L8E Out	1/4" bulge out in compression zone; 30% horizontal shear zone loss	108	
23	L8E In	1/4" free edge bow out	109	Yes
23	Bottom Chord at L8E	35% Web loss inside channel	110	
23	L8W In	1/4" bulge out in compression zone and vertical free edge; 28% horizontal shear zone loss	111	Outside fixed
24	L8W Out	Horizontal Shear Zone loss - 16%	112	L8W In Fixed
24	L6W Out	Horizontal Shear Zone loss - 20%	113	
24	L8E Out	1/4" bulge out in compression zone; 20% horizontal shear zone loss	114-115	Inside fixed
24	Bottom Chord under U5E	60% Web Plate loss by drain extension - Inside Plate (typical outside plate also); Channels intact	116-117	
24	Bottom Chord L4-L6E	47% isolated web loss on inside web plate under 2nd batten plate south of L4E; channels intact	118-119	
24	L2E Out	Horizontal Shear Zone loss - 6%	120	
24	L2W	Outside plate - Horizontal Shear Zone loss - 13%; Inside plate - 16% loss along the horizontal shear zone north portion only.	121	Analyzed, but not critical for 40 ton posting
24	L2E In	Horizontal Shear Zone loss - 20-30%; Interior web loss of the bottom chord just north of this panel point has 17% loss.	122-124a	Analyzed, but not critical for 40 ton posting
24	UOE Out	Isolated section loss at vertical shear zone near top chord - 63%	125-127	

New CF Doc
June 3rd CF Doc

Appendix B

2010 Critical Findings Documentation

Bridge 5900 Critical Finding Documentation June 3, 2010 Rehabilitation Inspection

Location: TH 43 over Mississippi River, RR, Streets

Owner: Mn/DOT District 6A

Team Lead Inspectors Present: Jennifer Zink, Ken Rand, Eric Evens, Larry Waletzki

Assistant Inspectors & Others: Craig Falkum, Steve Kirsch, Jai Kalsy, Dustin Thomas, Nancy Daubenberger, Romeo Garcia (FHWA), Rick Brown (SRF), Todd McMeans (MM)

During a bridge rehabilitation inspection on June 3, 2010 at Bridge 5900, the following findings initiated a critical finding per Mn/DOT Technical Memorandum 08-02-B-02:

Span 16 - L8W Gussets: - these plates are 3/8" thick nominal

- Exterior Gusset (Photo 1): 1/8"-1/4" bulge in compression zone with a 1/2" diameter hole in same location found in 2009 inspection. 34% loss measured in the compression zone and 36% loss measured along the horizontal shear zone. There is 3/4" pack rust along the gusset-to-lower chord interface.
- Interior Gusset: The interior gusset plate has 75% localized loss in an area of 4.5" x 1.5" along the vertical 14" down from the top of gusset. There is 3/4" pack rust along the gusset-to-lower chord interface.

Span 21 - L2W Gussets: - these plates are 3/8" thick nominal

- Exterior Gusset (Photos 2-3): Hole >2" now that was reported in 2009 as 1-1/4". Loss along horizontal shear zone above bottom chord is 10% overall and 20% on just the south portion.
- Interior Gusset: Nothing noted.

Span 21 - L4W Gussets: - these plates are 3/8" thick nominal

- Exterior Gusset: Nothing noted.
- Interior Gusset (Photos 4-5): 3/4" hole in horizontal shear zone above bottom chord found in 2009. South portion has 45% loss overall in the horizontal shear zone. North portion has 53% loss overall in the horizontal shear zone.

Span 21 - L4E Gussets: - these plates are 3/8" thick nominal

- Exterior Gusset: 27% loss in the horizontal shear zone noted in 2009.
- Interior Gusset (Photos 6-7): South portion has 60% loss in the horizontal shear zone. The north portion has no substantial loss noted.

Span 24 - L2W Gussets: - these plates are 5/8" thick nominal

- Exterior Gusset: 10% loss in the horizontal shear zone noted in 2009.

- Interior Gusset (Photo 8): 16% loss along the horizontal shear zone north portion only. South portion has no substantial loss.

Span 24 – L2E Gussets: - these plates are 5/8" thick nominal

- Exterior Gusset: No loss noted.
- Interior Gusset (Photos 9-10): 27% loss along horizontal shear zone north portion found in 2009 verified. Interior channel web loss of the bottom chord just north of this panel point has 17% loss.

Tom Styrbicki, Mn/DOT Bridge Inspection Program Manager, was contacted by Jennifer Zink onsite with finding. Yihong Gao in the Mn/DOT Bridge Office Load Ratings Unit was retained to perform a detailed analysis on the findings. It was determined that the Span 16 L8W exterior gusset plate controls the rating, and therefore is the first priority for repair.

As a result of the load rating analysis findings, the Mn/DOT Bridge Office affirms that the bridge should be posted at legal loads, or 40 tons, and to conduct repairs to the Span 16 L8W panel point exterior plate per the 2008 Wiss, Janney, Elstner Associates, Inc. gusset plate repair plans.

Additional findings may occur during the scheduled bi-annual fracture critical inspection on June 21-25, 2010. The 40 ton posting should remain in effect till after the fracture critical inspection findings are determined. The NBI superstructure rating was also adjusted to 3 by the Mn/DOT Bridge Office based on the gusset repairs needed and the load posting. The District will repair/reinforce the noted gusset plate next early week. Additional potential repair plans for other gusset plates will also be discussed next week.



Photo 1: Span 16 L8W Exterior Gusset Plate

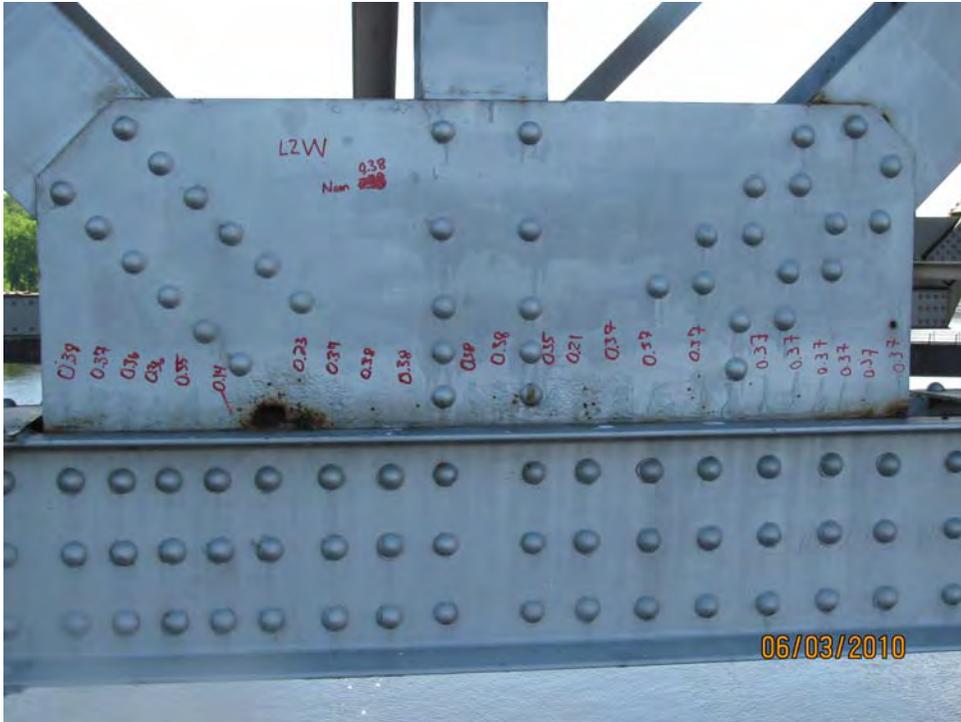


Photo 2: Span 21 L2W Interior Gusset



Photo 3: Span 21 L2W Interior Gusset Plate South Portion



Photo 4: Span 21 L4W Interior Gusset Plate South Portion



Photo 5: Span 21 L4W Interior Gusset Plate North Portion



Photo 6: Span 21 L4E Interior Gusset Plate South Portion



Photo 7: Span 21 L4E Interior Gusset North Portion



Photo 8: Span 24 L2W Interior Gusset Plate



Photo 9: Span 24 L2E Interior Gusset Plate South Portion



Photo 10: Span 24 L1-L2E Interior Bottom Chord Web

Bridge 5900 Critical Finding Documentation

June 21-25, 2010 Fracture Critical & Routine Inspection – Updated July 12, 2010

Location: TH 43 over Mississippi River, RR, Streets

Owner: Mn/DOT District 6A

Team Lead Inspectors Present: Jennifer Zink, Bill Nelson, Farrell Potter, Scott Theisen, Eric Evens

Assistant Inspectors: Dave Hedeem, Steve Miller, Ryan Rohne, Ramon Riba

During the fracture critical and routine inspection June 21-25, 2010 at Bridge 5900, the following finding initiated a critical finding per Mn/DOT Technical Memorandum 08-02-B-02:

Span 22 - L8W Gussets: - these plates are 3/8" thick nominal

- Exterior Gusset (Photo 1): 40% loss measured on the horizontal shear zone. There is also a 1/8" bulge out in the compression zone.
- Interior Gusset (Photo 2): 30% loss measured on the horizontal shear zone. There is also a 1/8" bulge out in the compression zone and 3/8" bow out on the vertical free edge.

Span 21 – L0E Gussets: - Due to the July 4th weekend, pedestrian loads were addressed in the continued analysis. As a result of pedestrian loads on the east truss, this nodes falls under critical status.

- Exterior Gusset (Photo 3): 20% loss measured in the horizontal shear zone. 37% loss measured in the compression zone at the end of the diagonal.
 - Interior Gusset (Photo 4): No notable loss in the horizontal shear zone. 30% loss measured in the compression zone at the end of the diagonal.
-

Yihong Gao – Load Ratings – was contacted onsite by Jennifer Zink via e-mail and performed a detailed analysis on the finding. Span 22 L8W gussets do not meet the load calculations for the less conservative, refined method of computing gusset plate capacity. The rating factor computes at 0.96. This is the most critical node identified during the inspection due to the distortion in the compression zone and section loss in the horizontal shear zone.

As a result of the analysis, the Bridge Office and District personnel did not feel it was necessary to close the bridge but felt that it was prudent and necessary to begin the work as soon as possible. Tuesday was the soonest that the bridge crew could gather materials and equipment to perform this work. The bridge could maintain the current posting of 40 tons through the weekend with repairs to commence June 29, 2010.

Another area discussed to be repaired includes Span 23 L8E exterior plate. Since the District has the use of 2 snoopers throughout the week of June 29, 2010, all notable L0/L8 panel points were analyzed with pedestrian loading added on the east truss. Other potential areas of repair are to be discussed over the next week and prioritized. A list was tabulated by Jennifer Zink of notable deficient locations (see pages 4-5). The Bridge Office will analyze and prioritize all locations for preventative actions. Applicable photos are located at:

<\\ad\bridge\Inspection\District 6\5900 Repairs>

The NBI superstructure rating has been adjusted to 2 by the Mn/DOT Bridge Office based on the needed gusset repair. It will be re-adjusted to a 3 once critical repairs are made to these gusset plates. A number of additional

superstructure steel members have severe deterioration in both the main and deck truss spans. There is severe section loss over a range of 20-50% in critical areas. Many moveable bearings are severely restricted or completely frozen. Analysis is currently underway, and additional repairs will be prioritized over a period of time.



Photo 1: Span 22 L8W Exterior Gusset



Photo 2: Span 22 L8W Interior Gusset



Photo 3: Span 21 LOE Exterior Gusset Plate



Photo 4: Span 21 LOE Interior Gusset Plate

Span	Location	Issue Noted	Photo #	Previous Fix?
16	L4W	Outside plate North Horizontal Shear Zone loss - 27%; Outside plate South Shear Zone localized loss of 34%; Inside plate localized loss at vertical - 15%	1-2	
16	L6W	Outside plate North Horizontal Shear Zone loss - 25%; Outside plate South Shear Zone - no loss ; Inside plate no loss	3-4	
16	L8W	Outside plate - 1/8"-1/4" bulge in compression zone with 1/2" diameter hole in same location found in 2009 inspection. 34% loss measured in the compression zone and 36% loss measure along the horizontal shear zone. Inside plate - 75% localized loss in an area of 4.5" x 1.5" along the vertical 14" down from top of gusset. Localized horizontal shear loss of 26% for 2" from free edge.	5-6	Outside Plate Fixed June 2010
17	L2W Out	Outside plate - Horizontal shear zone loss 20% overall, 16% loss along north diagonal, Top free edges bowed out 1/4", South side free edge bowed out 3/16"	7	
17	L2W In	Inside plate - Horizontal shear zone loss 20% south side only, 33% localized loss on south side at vertical	8	
17	L4E Out	Outside plate - North compression zone loss 28%, South Compression zone loss 25%, Horizontal shear zone loss 16%	9	
17	L8E Out	Outside plate - 15% loss horizontal shear zone, 26% loss compression zone, 43% loss at vertical just above diagonal	10-13	Inside plate fixed
17	L8W Out	Outside plate - 23% loss horizontal shear zone, 16% loss compression zone; Inside plate - fixed but vertical edge bow out 1/4"	14-15	Inside plate fixed
19	Stringer 1 at FB18 N	56% loss where stringer meets floorbeam connection	16	
19	FB11' W	FB web loss at stringer connection - isolated north side 70% loss, isolated south side 82% loss	17-20	
19	Pins at U15 and U15' E & W	Wear of up to 1/2" on pin. Pin is 25" long and 5" in diameter. Pins at U16 and U16' have no wear.	20a	
21	L2W	Outside plate - Hole >2" now that was reported in 2009 as 1-1/4". Loss along horizontal shear zone above bottom chord is 10% overall and 20% on just the south portion. Inside plate - Localized horizontal shear zone loss of 33%	21-22	Analyzed, but not critical for 40 ton posting
21	L4W	Outside plate - South horizontal shear zone loss of 25%. Inside plate - Horizontal shear zone loss about 50% overall with 3/4" through corrosion on north side	23-27	Analyzed, but not critical for 40 ton posting
21	L4E	Outside plate - 27% loss in the horizontal shear zone noted in 2009; Inside plate - South portion has 60% loss in the horizontal shear zone, north portion has no substantial loss	28-30	Analyzed, but not critical for 40 ton posting
21	L6W	Inside plate - North horizontal shear zone loss 25% overall	31	
21	L8W	Outside plate - Horizontal shear zone loss of 33%; Inside plate - Horizontal shear zone loss 20% (avg=26.5%)	32-34	Comp. Zone Inside/Outside plate
21	L8E	Outside plate - Horizontal shear zone loss of 20%, Compression zone loss of 33%; Inside plate - fixed in 2000	35-36	
22	L0E Out	Horizontal Shear Zone loss - 20%; Compression zone loss - 37%	37-38	done
22	L0E In	Horizontal Shear Zone no notable loss; Compression zone loss - 30%	39-40	done
22	L0L2E	BC loss at gusset interface interior channel at 43% loss	38, 40	
22	U1E In/Out	Outside plate bottom south free edge 3/16" bow out; Inside plate vertical north free edge 1/2" bow out - not due to pack rust or fit up	41-47	
22	U5W In South	1/8" bend in near top chord	48	
22	L4E	Inside Plate - South horizontal shear zone loss 10%	49	
22	L4-L6E	Inside channel corrosion south of L4E	50-54	
22	L8E Out	5/16" vertical free edge distortion; 1/8" bulge out in compression zone	55-56	Yes

22	L8W In	Horizontal Shear Zone Loss - 30%; 3/8" bow out on vertical free edge	59-60	
22	Bottom Chord near L8W	10% Web loss outside channel; 40% web loss inside channel	61-65	
23	L0E Out	5/8" bulge out in compression zone with 25% loss; 27% loss in horizontal shear zone	66-71	L0E In Fixed
23	Bottom Chord near L0E	50% Web loss inside channel - with hole; 30% web loss outside channel; about 30% loss all flanges	72-76	
23	Bottom Chord near L4E	18" south of L4E for 80" - Loss of section; 3/8" web plate 50% gone with areas of through corrosion; overall with channel intact is a loss of 25-30% overall	77-90	
23	L0W In	1/4" bulge out in compression zone; 25% loss in horizontal shear zone	91-97	L0W Out Fixed
23	L2E Out	Horizontal Shear Zone Loss - 30%	98	
23	L2W Out	1" diameter through corrosion along with 25% overall loss in horizontal shear zone	99-102	
23	L6W Out	Horizontal Shear Zone Loss - 20%	103-104	
23	Bottom Chord near L8W Out	18% Web loss outside channel	105-106	
23	L6E Out	Horizontal Shear Zone Loss - 14%	107	
23	L8E Out	1/4" bulge out in compression zone; 30% horizontal shear zone loss	108	
23	L8E In	1/4" free edge bow out	109	Yes
23	Bottom Chord at L8E	35% Web loss inside channel	110	
23	L8W In	1/4" bulge out in compression zone and vertical free edge; 28% horizontal shear zone loss	111	Outside fixed
24	L8W Out	Horizontal Shear Zone loss - 16%	112	L8W In Fixed
24	L6W Out	Horizontal Shear Zone loss - 20%	113	
24	L8E Out	1/4" bulge out in compression zone; 20% horizontal shear zone loss	114-115	Inside fixed
24	Bottom Chord under U5E	60% Web Plate loss by drain extension - Inside Plate (typical outside plate also); Channels intact	116-117	
24	Bottom Chord L4-L6E	47% isolated web loss on inside web plate under 2nd batten plate south of L4E; channels intact	118-119	
24	L2E Out	Horizontal Shear Zone loss - 6%	120	
24	L2W	Outside plate - Horizontal Shear Zone loss - 13%; Inside plate - 16% loss along the horizontal shear zone north portion only.	121	Analyzed, but not critical for 40 ton posting
24	L2E In	Horizontal Shear Zone loss - 20-30%; Interior web loss of the bottom chord just north of this panel point has 17% loss.	122-124a	Analyzed, but not critical for 40 ton posting
24	U0E Out	Isolated section loss at vertical shear zone near top chord - 63%	125-127	

New CF Doc	
June 3rd CF Doc	

Appendix C

2010 Load Rating Letter & WIM Data



Memo

Office of Bridges and Structures
3485 Hadley Avenue North
Oakdale, MN 55128-3307

Phone No: 651-651-366-4501
Fax No: 651-366-4497

June 9, 2010

To: Nelrae Succio – District Engineer, District 6

From: Dan Dorgan – State Bridge Engineer

Dan Dorgan FOR DAN DORGAN

Subject: Bridge 5900 Rating and Posting
TH 43 over Mississippi River in Winona

Mn/DOT bridge inspectors conducted a rehabilitation inspection of Bridge 5900 on June 3, 2010. During this inspection they observed several locations where continuing corrosion has reduced the thickness of steel in the gusset plate members beyond what was observed in past years. This was declared and documented as Critical Finding.

Steel thickness measurements were taken at several locations and the gusset plates were analyzed to establish the structural capacity of the connections. Calculations show that the typical safety factors are not achieved for the exterior gusset plate at Span 16 - west truss - panel point L8.

Based on this finding, we recommend that this bridge be posted at 40 Tons with posting sign R12-5. This posting allows legal loads to cross, but will exclude all overweight permits and seasonal overweights.

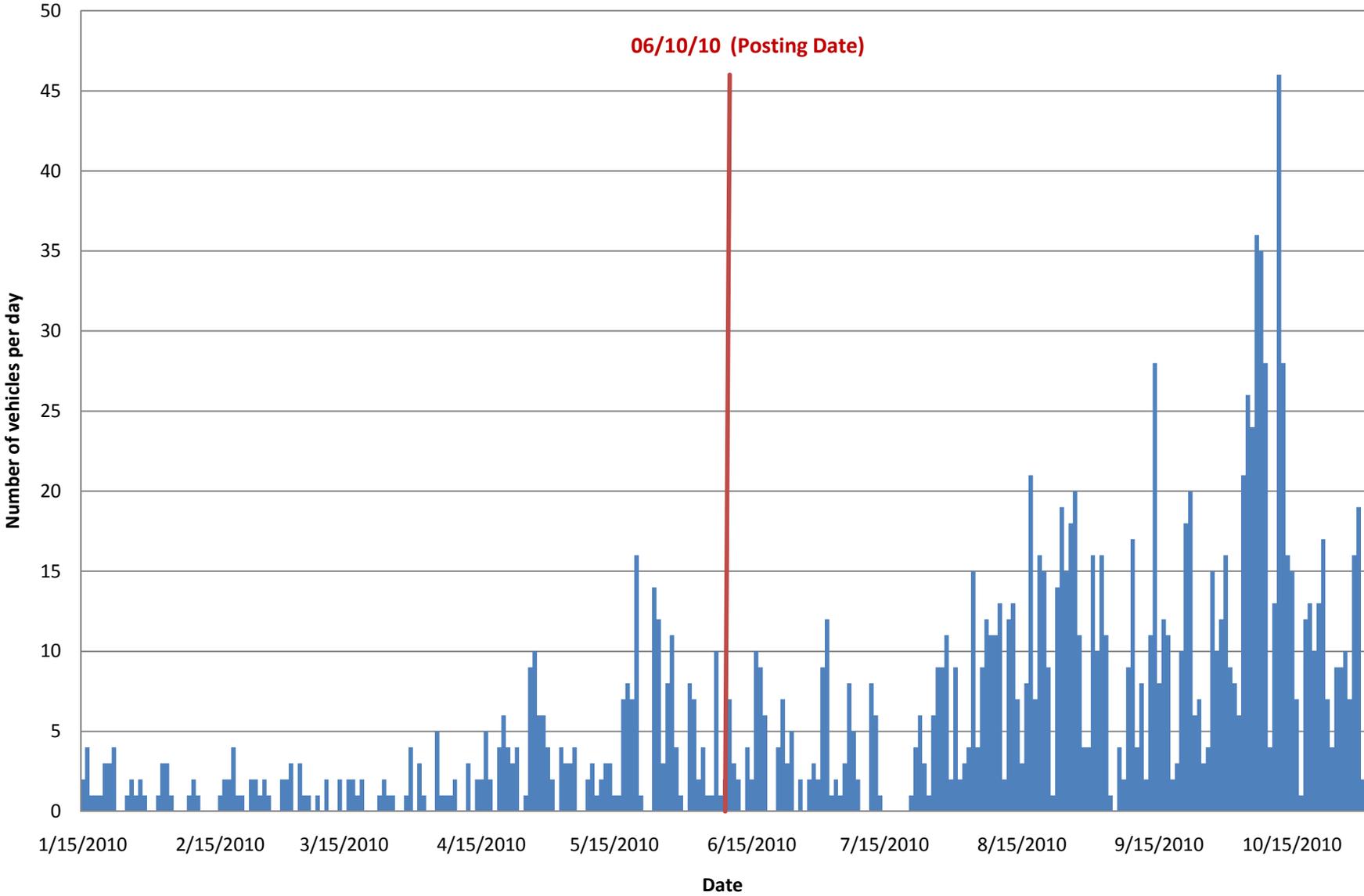
The Bridge Office will coordinate with you to schedule and perform repairs on this gusset plate.

Please inform the Bridge Management Unit when the signs have been erected. You can contact Tom Styrbicki, Bridge Construction and Maintenance Engineer, if you have any questions.

cc: Tom Styrbicki
Lowell Johnson,
Dustin Thomas
Jennifer Zink
Todd Niemann
James Pierce
Steve Kirsch
Craig Falkum
Gene Halverson

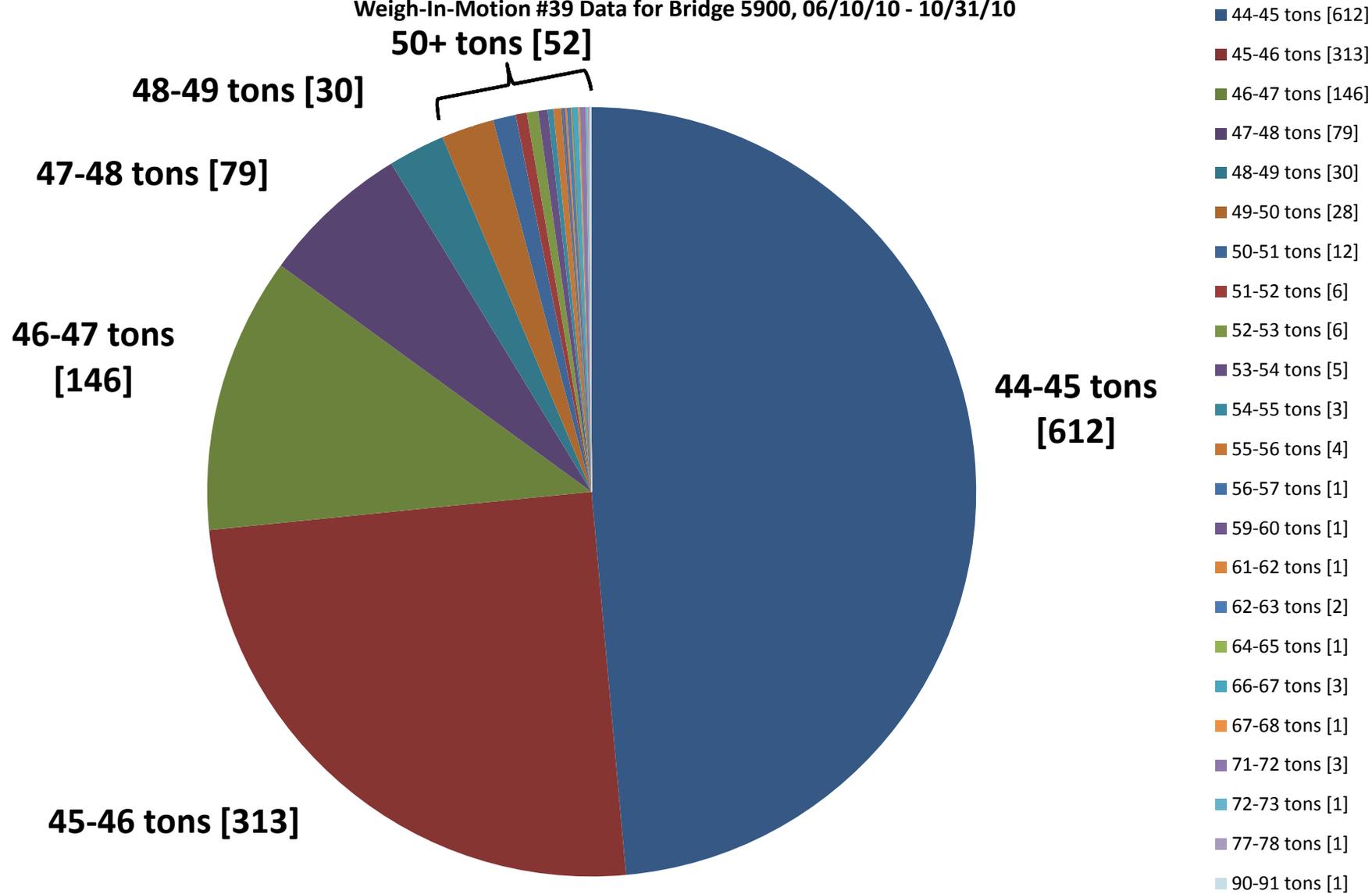
Vehicles Per Day with a Gross Vehicle Weight of Over 44 tons

Weigh-In-Motion #39 Data for Bridge 5900, 01/15/10 - 10/31/10



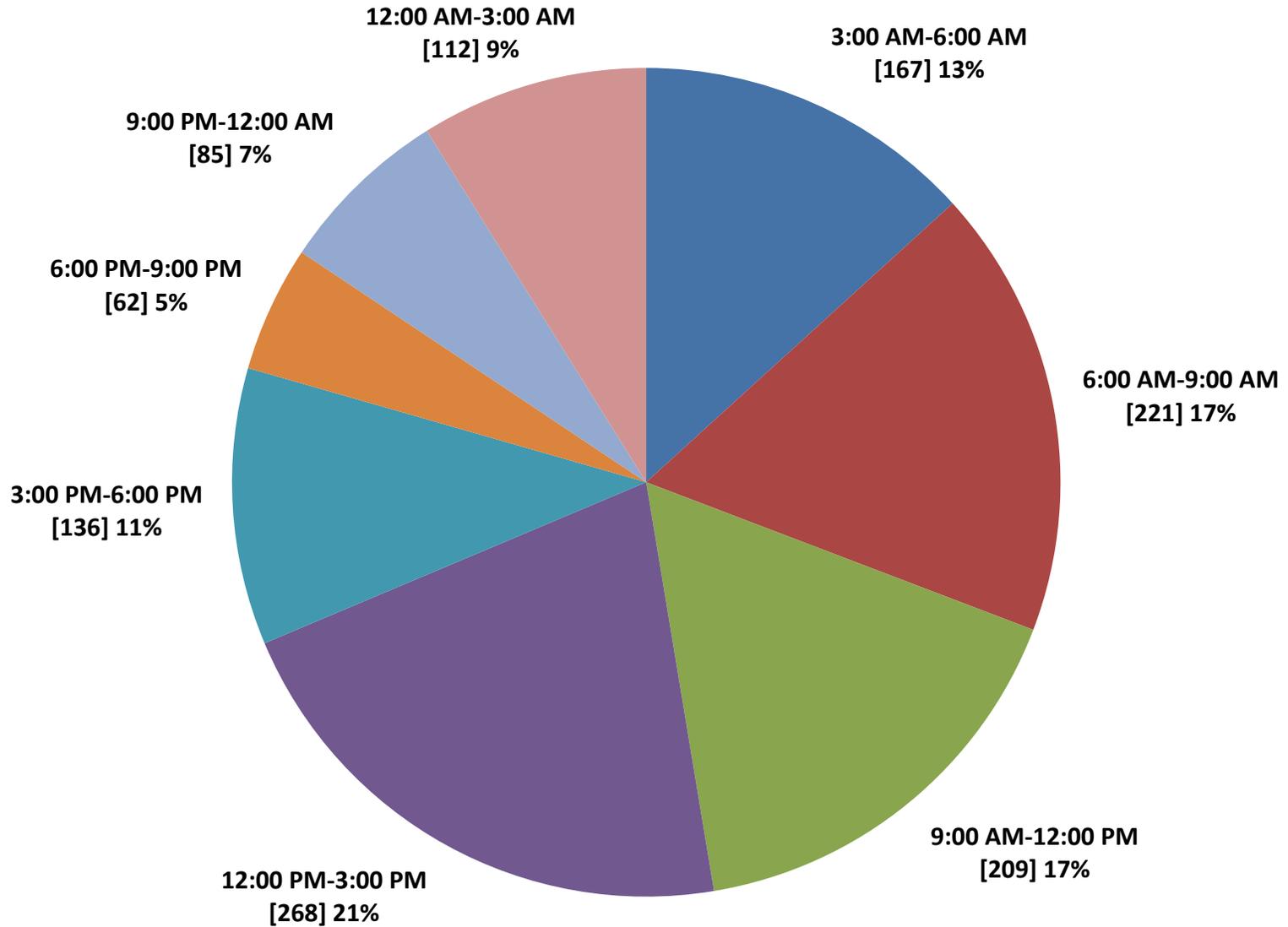
Distribution of Gross Vehicle Weight Over 44 Tons After 06/10/10 Posting

Weigh-In-Motion #39 Data for Bridge 5900, 06/10/10 - 10/31/10



Time Distribution of Gross Vehicle Weight Over 44 Tons

Weigh-In-Motion #39 Data for Bridge 5900, 06/10/10 - 10/31/10



I. Findings Summary

This report documents the findings of the routine and fracture critical inspection of Mn/DOT Bridge No. 5900, TH 43 over the Mississippi River, Canadian Pacific Railroad, W 2nd Street, W 3rd Street, and Old Duke Road. The inspection started on June 18, 2012 and was completed on June 20, 2012.

Significant Findings

Following is a summary of some of the more significant observations and recommendations:

1. Span 19 Stringer 1 at Floorbeam 12 West has numerous areas of through corrosion in the web for 2 feet (Photo 7). No web crushing evident. Areas around the holes are nominal in thickness. The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss.

Recommendation: No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

2. Three bottom chord-to-gusset interface locations exhibit significant section loss:
Span 18 Main Through Truss – L0-L1W at L0W Gusset Interface (Photos 1-6):

- Interior Channel Web – 27% Loss
- Interior Channel Bottom Flange – 19% Loss
- Interior Channel Top Flange – 23% Loss
- Exterior Channel Web – 20% Loss
- Exterior Channel Bottom Flange – 7% Loss
- Exterior Channel Top Flange – 37% Loss
- Overall Section Loss – 22%

Span 20 Main Through Truss – L0'-L1'E at L0'E Gusset Interface (Photo 8):

Section loss calculated at 42% Loss in Channel Web Interior – no measurements taken at this location of channel flanges or Exterior Channel. Assume losses similar to Span 18 location above:

- Interior Channel Web – 42% Loss
- Interior Channel Bottom Flange – 19% Loss
- Interior Channel Top Flange – 23% Loss
- Exterior Channel Web – 20% Loss
- Exterior Channel Bottom Flange – 7% Loss
- Exterior Channel Top Flange – 37% Loss
- Overall Section Loss – 25%

Span 23 Deck Truss – L8W Bottom Chord Interface to Gusset (Photo 9):

Readings not taken of channel flanges or of exterior channel – assume loss is 17% overall based on interior channel web.

- Interior Channel Web – 17% Loss

Recommendation: The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

3. An underwater inspection performed in 2012. The channel bottom has undergone significant changes since 2008. Localized scour and channel bottom degradation was observed in the vicinity of the bridge, resulting in an increase in extent of the foundation exposure at Piers 19 and 20. At Pier 19 the vertical footing exposure increased 1.5 feet to full height (5.5 feet) of footing exposure, along with some seal exposure. In addition, foundation undermining (3 feet high) has developed at the pier and five exposed timber piles were encountered. Overall channel drop of 13 feet since 2008. Due to these developments, the consultant returned to the bridge at a later date equipped with underwater acoustic imaging system. Given the overall size of Pier 19, and the large number of foundation piles, the current conditions do not significantly affect the pier's structural stability. The amount of channel bottom change warrants countermeasures, and in the interim demands careful monitoring. Refer to the 2012 Underwater Inspection report in Appendix D for further details and photos.

Recommendation: The MnDOT Bridge Office met on October 18, 2012 to discuss the findings. It was determined that the frequency of routine underwater inspections will remain at 48 months. More frequent underwater inspections may be performed on a case-by-case basis, as warranted by significant flood events and other situations that result in pile exposure. These will be coordinated through MnDOT District 6 and the Bridge Office Hydraulics Unit. The MnDOT scour monitoring equipment mounted on Piers 19 and 20 provides real-time information on water level, channel depth and other data that are accessible online (Appendix E). The data will show when scour causes the footing to be undermined and piles exposed. For example, current data shows that the scour hole exposing the Pier 19 piles has already started filling back in. The current plan for bridge improvement calls for rehabilitation of the existing bridge, along with construction of a second bridge directly upstream. For this reason, there are no immediate plans to place riprap around the existing footings, as it might need to be removed to facilitate the new construction. Scour around the existing piers will be carefully monitored during construction of the new bridge substructures, as scour patterns may change. The NBI rating was recommended to go from 6 to 5, and a concrete pier footing element should be added. This will be completed via an Update Report in SIMS once this Fracture Critical Report is approved.

4. Weigh-in-Motion sensors were installed by Cy-Con Inc. in the pavement on the bridge on October 27, 2009 that collects traffic data including number, type, and weight of vehicles. The most recent analysis of the data was in the 2010 Fracture Critical Report. More recent data will be provided via an Update Report in SIMS once complete.

Recommendation: The Bridge Office will complete analysis of the data over the past two years and provide to the District via an Update Report.

NBI Condition Summary

While District 6 has the final authority in determining the NBI and element condition ratings, the ratings recommended by the Mn/DOT Bridge Office in the 2012 7 Day Fracture Critical Report and input into SIMS are:

NBI Condition Ratings			
Item	Current	Suggested	Comments
Deck	5 (Fair Condition)	5 (Fair Condition)	Changed to 5 in 2010 due to extensive cracking, leaching, and areas of under-deck delamination.
Superstructure	4 (Poor Condition)	4 (Poor Condition)	Changed to 4 in 2010 due to severe deterioration of steel truss members in both the main and deck truss spans with section loss over a range of 20-50%. Numerous repairs completed in 2010 as a result.
Substructure	6 (Satisfactory Condition)	6 (Satisfactory Condition)	NBI of 6 since 1999.
Channel	6 (Bank slump; minor damage)	6 (Bank slump; minor damage)	Changed to 6 in 2010 due to exposed pier footings and scour depressions as identified in the 2008 underwater inspection.

Inventory Updates

Inventory items updated by the Bridge Management Unit or as listed for the District to review include:

Review Wearing Surface Install Year and Depth as surface type is listed in the inventory as Monolithic Concrete.

Unsound Deck Percentage changed from 2% to 5% due to the number of underdeck delaminations.

MnDOT Scour Code Year is missing.

The MnDOT Permit Codes are listed as No Restriction; however, the rating and posting letter dated June 9, 2010 recommended the bridge be posted at 40 tons with posting sign R12-5 which excludes all overweight permits and seasonal overweights.

V. Pictures



Photo 1 - Span 18 LOW Inside Channel Bottom Flange Losses at LOW



Photo 2 - Span 18 LOW Inside Channel Losses at LOW

Pictures



Photo 3 - Span 18 LOW Inside Channel Top Flange Losses at LOW



Photo 4 - Span 18 LOW Outside Channel Bottom Flange Losses

Pictures



Photo 5 - Span 18 LOW Outside Channel Bottom Flange Losses



Photo 6 - Span 18 LOW Outside Channel Top Flange Loss

Pictures



Photo 7 - Span 19 Stringer 1 Web Through Corrosion at L12W North



Photo 8 - Span 20 SL on Int web @ L0' down to .16 in

Pictures



Photo 9 - Span 23 SL @L8 Int Web

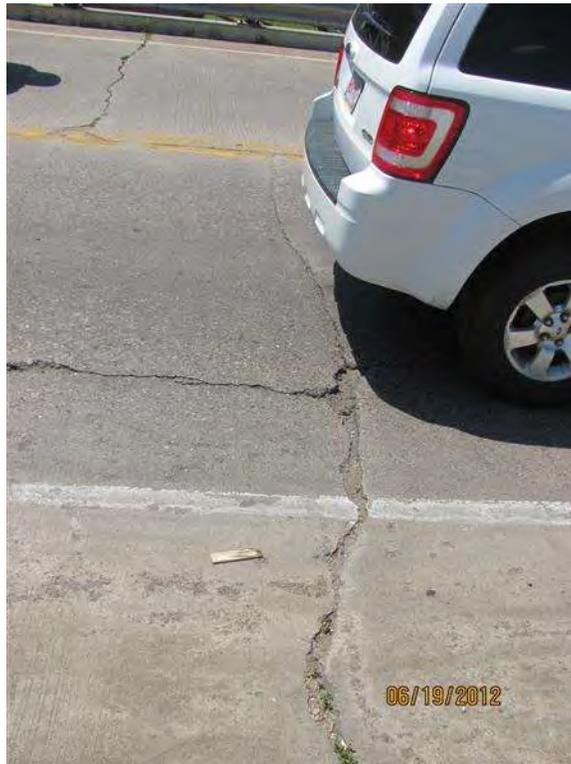


Photo 10 - South Approach Cracking and Spalls

7 Day Fracture Critical Report (Report Date: 10/03/2012)

Disclaimer: The condition ratings in this report are only suggested. It is the responsibility of the Bridge Owner to approve inspection data in SIMS.

Bridge # 5900
 Facility Carried: TH 43
 Facility Intersected: MISS RVR, RR, STREETS
 Bridge Owner: State Highway Agency
 Inspection Date(s): 06/18/2012 - 06/20/2012
 Primary Inspector: Zink, Jennifer
 Other Inspector(s): Carter, Rodney; Miles, Tom; Nelson, Bill; Potter, Farrell; Rand, Ken; Theisen, Scott; Waletzki, Gary
 Method of Access: A-62, A-62, A-62, Other - 80' Lift
 Traffic Control: Provided by District 6 Winona and Dresbach Bridge Crews
 Scope of Inspection: Routine and Fracture Critical

Critical Structural Deficiencies (Yes/No) No
 New Load Rating Recommended (Yes/No) No *See notes for elements 113 and 121.
 Traffic Safety Hazard (Yes/No) No
 Structural Analysis Recommended (Yes/No) No *See notes for elements 113 and 121.

NBI Condition Ratings			
Item	Current	Suggested	Comments
Deck	5	5	Changed to 5 in 2010 due to extensive cracking, leaching, and areas of under-deck delamination.
Superstructure	4	4	Changed to 4 in 2010 due to severe deterioration of steel truss members in both the main and deck truss spans with section loss over a range of 20-50%. Numerous repairs completed in 2010 as a result.
Substructure	6	6	NBI of 6 since 1999.
Channel	6	6	Changed to 6 in 2010 due to exposed pier footings and scour depressions as identified in the 2008 underwater inspection.

Suggested Element Condition Rating Changes in RED

#	Element Description	Quantity	Element Condition Ratings				
			1	2	3	4	5
022	Low Slump O/L (Concrete Deck with Uncoated Rebar)	12,082 SF	0	12,082	0	0	0
026	Top of Concrete Deck (No Overlay - Epoxy Rebar)	64,106 SF	64,106	0	0	0	0
107	Painted Steel Girder or Beam	785 LF	220	360	200	5	0
109	Prestressed Concrete Girder or Beam	421 LF	417	4	0	0	
110	Reinforced Concrete Girder or Beam	1,686 LF	1,429	240	17	0	
113	Painted Steel Stringer	12,593 LF	3,593	5,500	3,200	298	2
121	Painted Steel Through Truss - Bottom Chord	1,867 LF	0	0	1,400	463	4
126	Painted Steel Through Truss - Upper Members	1,867 LF	0	700	1,040	127	0
131	Painted Steel Deck Truss	1,560 LF	0	0	650	900	10
152	Painted Steel Floorbeam	3,315 LF	205	1,609	1,300	200	1
161	Pin & Hanger (or Hinge Pin) Assembly (Painted)	12 EA	0	4	4	4	0
205	Reinforced Concrete Column	49 EA	22	20	7	0	
210	Reinforced Concrete Pier Wall	211 LF	111	89	11	0	
215	Reinforced Concrete Abutment	79 LF	58	21	0	0	
234	Reinforced Concrete Pier Cap	840 LF	595	226	19	0	
300	Strip Seal Deck Joint	372 LF	356	16	0		

Suggested Element Condition Rating Changes in RED							
#	Element Description	Quantity	Element Condition Ratings				
			1	2	3	4	5
301	Poured Deck Joint	1,085 LF	1,081	4	0		
303	Assembly Deck Joint (with or without seal)	93 LF	0	93	0		
310	Elastomeric (Expansion) Bearing	35 EA	35	0	0		
311	Expansion Bearing	49 EA	28	21	0		
313	Fixed Bearing	37 EA	14	23	0		
321	Concrete Approach Slab-Concrete Wearing Surface	2 EA	2	0	0	0	
334	Metal Bridge Railing (Coated or Painted)	1,867 LF	929	652	285	0	0
357	Pack Rust Smart Flag	1 EA	0	0	1	0	
358	Concrete Deck Cracking Smart Flag	1 EA	1	0	0	0	
359	Underside of Concrete Deck Smart Flag	1 EA	0	0	1	0	0
360	Substructure Settlement & Movement Smart Flag	1 EA	1	0	0		
361	Scour Smart Flag	1 EA	1	0	0		
363	Section Loss Smart Flag	1 EA	0	0	0	1	
377	Low Slump O/L (Concrete Deck with Epoxy Rebar)	2,423 SF	0	2,423	0	0	0
380	Secondary Structural Elements	1 EA	0	1	0	0	
387	Reinforced Concrete Wingwall	2 EA	0	2	0	0	
409	Chain Link Fence	3,630 LF	3,630	0	0	0	0
422	Painted Beam Ends	8 EA	4	2	2	0	0
423	Gusset Plate Truss Connection - Painted Steel	320 EA	60	120	140	0	0
964	Critical Finding Smart Flag	1 EA	1	0			
966	Fracture Critical Smart Flag	1 EA	0	1	0		
967	Gusset Plate Distortion Smart Flag	1 EA	0	1	0	0	
981	Signing	1 EA	1	0	0	0	0
982	Approach Guardrail	1 EA	1	0	0		
984	Deck & Approach Drainage	1 EA	0	1	0		
985	Slopes & Slope Protection	1 EA	0	1	0		
986	Curb & Sidewalk	1 EA	0	1	0		
988	Miscellaneous Items	1 EA	0	1	0		

Element Rating Notes:

ELEMENT #113: Refer to the snoopers inspection report and the 2010 fracture critical report for further details. [2012] Span 19 Stringer 1 at Floorbeam 12 West has numerous through corrosion in web for 2 feet (Photo 7). No web crushing evident. Areas where the holes are nominal in thickness. The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

ELEMENT #121: Refer to the snoopers inspection report and the 2010 fracture critical report for further details. [2012] Three bottom chord-to-gusset interface locations exhibit significant section loss:

1.Span 18 Main Through Truss – L0-L1W at L0W Gusset Interface (Photos 1-6):

- Interior Channel Web – 27% Loss
- Interior Channel Bottom Flange – 19% Loss
- Interior Channel Top Flange – 23% Loss
- Exterior Channel Web – 20% Loss
- Exterior Channel Bottom Flange – 7% Loss
- Exterior Channel Top Flange – 37% Loss
- Overall Section Loss – 22%

2.Span 20 Main Through Truss – L0'-L1'E at L0'E Gusset Interface (Photo 8):

Section loss calculated at 42% Loss in Channel Web Interior – no measurements taken at this location of channel flanges or Exterior Channel. Assume losses similar to Span 18 location above:

- Interior Channel Web – 42% Loss

Interior Channel Bottom Flange – 19% Loss
Interior Channel Top Flange – 23% Loss
Exterior Channel Web – 20% Loss
Exterior Channel Bottom Flange – 7% Loss
Exterior Channel Top Flange – 37% Loss
Overall Section Loss – 25%

3.Span 23 Deck Truss – L8W Bottom Chord Interface to Gusset (Photo 9):

Readings not taken of channel flanges or of exterior channel – assume loss is 17% overall based on interior channel web.

Interior Channel Web – 17% Loss

The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

ELEMENT #361: [2011] R - Scour critical. Monitoring required. Refer to the Collins Engineering underwater inspection completed in 2008.

ELEMENT #423: [2012] 35 gusset plates repaired/reinforced or analyzed structurally in 2010. Condition upgraded to CS3 from CS5 for those locations.

6/3/2010: See critical finding notes (JLZ). Gusset plate element was added in 2009. Fifteen gusset plates were repaired/reinforced in 2008. Design work was completed by WJE Engineers. The Winona and Rochester Bridge Crews reinforced all of the L0 and L8 gusset plates on the approach deck truss on both ends of the bridge. Several additional gusset plates and lower chord sections were also reinforced. All of this work was completed per Bridge Office instructions. Refer to the snooper inspection report and the 2010 fracture critical report for further details.

ELEMENT #964: [2012] No critical findings during the June 2012 Fracture Critical Inspection. 7/1/2010 - Critical gussets repaired. NBI upgraded from 2 to 3. No longer critical. Further repairs eventual. 6/24/2010: Span 22 L8W Ext-Int and Span 21 L0E gusset plates have 20%-40% loss in the horizontal shear zone. Posting to remain at 40 tons. District to repair gussets the week of June 28, 2010.

Additional repair locations will be addressed as well.

6/3/2010: During a bridge rehab inspection, advanced section loss with areas of through corrosion were found at Sp16 L8W, Sp 21 L2W, Sp 21 L4W, Sp21 L4E, Sp24 L2W, and Sp24 L2E. Tom Styrbicki was contacted by Jennifer Zink onsite with findings. Yihong Gao performed detailed load rating analysis on the findings. Span 16 L8W exterior gusset plate controls the rating, and therefore is the first priority for repair. The bridge should be posted at legal loads, or 40 tons, and repairs to t Span 16 L8W panel point exterior plate per the 2008 Wiss, Janney, Elstner Associates, Inc. gusset plate repair plans should be made. Additional findings may occur during the scheduled bi-annual fracture critical inspection on June 21-25, 2010. The 40 ton posting should remain in effect till after the fracture critical inspection findings are determined. NBI Super changed to 3 (JLZ). Repairs made on 6/8/2010 to L8W on Span 16. NBI to remain a 3 until full bridge is assessed after the June 21-25 FC inspection. 6/2/08: See 2008 FC Inspection.

ELEMENT #966: [2012] Fracture critical inspection completed in June 2012. All damaged or deteriorated fracture critical members identified have either been repaired in a previous year or structural analysis has determined that the member is stable for the anticipated loading (see elements 113, 121, and 423). Condition upgraded to CS2 from CS3.

6/3/2010: See Critical Finding notes (JLZ). The last fracture critical inspection was completed in June of 2010. As an outcome of this inspection, the Bridge Office will analyze numerous areas and advise the District on repair actions that will be required. Refer to the in-depth report for location of F/C members.

ELEMENT #967: [2012] Distortions noted in previous inspections have either been reinforced, reviewed structurally, or have not changed. Condition state upgraded from CS4 to CS2.

[2010] Span 22U1E north free edge exhibits 1/2" distortion not due to pack rust or fit up. This distortion has increased from 1/8" - 1/4" as reported in 2009. The Bridge Office was made aware of this condition in 2010 and will analyze. Other areas of distortion exist along free edges due to pack rust and/or fit up. A number of compression zone areas are distorted outward on the deck truss gusset plates. Scattered gusset plates were reinforced by contract in 2008 and by the Winona and Rochester Bridge Crews in 2010. Refer to the snooper inspection report and the 2010 fracture critical report for further details.

General Notes:

Bridge 5900 This report was updated by Eric Evens on July 27, 2010.

NOTE: Bridge was inspected in 2011 By Eric Evens, Robert Pyfferoen, Steven Miller and Gary Waletzki

NOTE: Bridge was inspected in 2011 with snooper truck by Eric Evens and Steven Miller

NOTE: All spans, piers and floorbeam's are numbered from the south (Minnesota end) and all beams, girders, bearings and columns are numbered from the west.

NOTE: Bridge was inspected using the snooper in 2010.

NOTE: This structure has a scour code rating of "R" CRITICAL MONITOR. There are no scour monitoring signs mounted on the bridge.

NOTE: Underwater inspection was completed by Collins Engineering in 2008.

NOTE: All steel members were painted in 1986. The high truss spans 18 through 20 were painted in 1992 and 1993.

NOTE: In 2008, a contract was let to replace the concrete sidewalk with timber, selected gusset plates were reinforced and selected panel points were painted.

NOTE: Fracture critical inspection was completed by the Bridge Office in June of 2010. Pin assemblies were U T inspected in June of 2010. As an outcome of this inspection, the Bridge Office will analyze numerous areas and advise the District on repair actions that will be required.

NOTE: Refer to the attached Snooper Inspection Report for further details.

NOTE: Bridge was inspected in 2010 by Eric Evens, Robert Pyfferoen, Brian Haugen, Steve Miller and the Bridge Office Fracture Critical Section.

NOTE: The Winona and Rochester Bridge Crews reinforced all of the L0 and L8 gusset plates on the approach deck truss on both ends of the bridge. Several additional gusset plates and lower chord sections were also reinforced. All of this work was completed per Bridge Office instructions.

Channel - NBI 6 Refer to the underwater inspection report from Collins Engineering for this rating.

NOTE: On 9/28/2010 Brian Haugen per the request of Craig Falkum the District 6 structures engineer changed the NBI rating of the Superstructure from a three (3) to a four (4). The change was due to the repairs made after the 2010 in-depth fracture critical inspection was completed.

A report for 2011 was entered but had difficulty with interrogation with SIMS and D-6 inspection first year jitters.

[2012] 7 Day FC Report entered in SIMS on 10/3/2012 due to unavailability of report previously. Original 7 Day in Word format sent to owner on 6/27/2012.

Inventory Item Notes:

[2012] Review Wearing Surface Install Year and Depth as a surface type is listing in the inventory as Monolithic Concrete. MnDOT Scour Code Year is missing. The Mn/DOT Permit Codes are listed as No Restriction; however, the rating and posting letter dated June 9, 2010 recommended the bridge be posted at 40 tons with posting sign R12-5 which exclude all overweight permits and seasonal overweights.

58. Deck NBI: Changed to 5 in 2010 due to extensive cracking, leaching, and areas of under-deck delamination.
- 36A. Brdg Railings NBI:
- 36B. Transitions NBI:
- 36C. Appr Guardrail NBI:
- 36D. Appr Guardrail Terminal NBI:
59. Superstructure NBI: Changed to 4 in 2010 due to severe deterioration of steel truss members in both the main and deck truss spans with section loss over a range of 20-50%. Numerous repairs completed in 2010 as a result.
60. Substructure NBI: NBI of 6 since 1999.
61. Channel NBI: Changed to 6 in 2010 due to exposed pier footings and scour depressions as identified in the 2008 underwater inspection.
62. Culvert NBI:
71. Waterway Adeq NBI:
72. Appr Roadway Alignment NBI:

I. Findings Summary

This report documents the findings of the routine and fracture critical inspection of Mn/DOT Bridge No. 5900, TH 43 over the Mississippi River, Canadian Pacific Railroad, W 2nd Street, W 3rd Street, and Old Duke Road. The inspection started on June 2, 2014 and was completed on June 5, 2014.

Significant Findings

Following is a summary of some of the more significant observations and recommendations:

1. Span 19 Stringer 1 at Floorbeam 12 West web continues to show increased through-corrosion (Photo 102). No web crushing is evident. Other areas of web through corrosion have developed in other stringers in the through truss spans: Span 18 Stringer 1 L8W, Span 18 Stringer 6 L8E, Span 19 Stringer 2 FB11, and Span 19 Stringer 5 L18'E. Add 8 more feet to CS5. No web crushing; therefore, structural analysis is not needed at this time since the stringer load rating factors are high. Fascia stringers along Spans 18-20 are heavily corroded along the bottom flange at the floorbeam connections up to 3/8" loss. Surface corrosion is present along entire length of fascia stringers. The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss.

Recommendation: No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

2. Entire lower chord of main truss spans 18-20 up through the splash zone is CS4 due to extensive flaking and pack rust with notable loss of section mainly near gusset plate locations (Photos 56-59). Many batten plates and lacing bars have through corrosion. Notable locations of loss recorded include: Span 19 L15-L16E at L16SE up to 30% web loss and up to 20% flange loss but with likely an overall section loss less than 20% (typical for more of the bottom chord members of this type); Span 19 L12'-L13'W 15.3% overall loss. Analysis was completed by the MnDOT Bridge Office for these locations. L15-L16 can take losses up to 40-50% overall before affecting the current posting; L12-L13 is approaching the threshold of a posting revisions and/or repair. Close monitoring of these locations during each inspection must be noted and reported to the Bridge Office immediately if additional losses are incurred. These entire chord sections (6 segments total) are rated CS5. Losses noted at the locations in 2012 have not changed significantly, but quantity will remain in CS5. Three bottom chord-to-gusset interface locations exhibit significant section loss:

Span 18 Main Through Truss – L0-L1W at L0W Gusset Interface:

- Interior Channel Web – 27% Loss
- Interior Channel Bottom Flange – 19% Loss
- Interior Channel Top Flange – 23% Loss
- Exterior Channel Web – 20% Loss
- Exterior Channel Bottom Flange – 7% Loss
- Exterior Channel Top Flange – 37% Loss
- Overall Section Loss – 22%

Span 20 Main Through Truss – L0'-L1'E at L0'E Gusset Interface:

Section loss calculated at 42% Loss in Channel Web Interior. No measurements were taken at this location of channel flanges or Exterior Channel. Assume losses similar to Span 18 location above:

- Interior Channel Web – 42% Loss
- Interior Channel Bottom Flange – 19% Loss
- Interior Channel Top Flange – 23% Loss
- Exterior Channel Web – 20% Loss
- Exterior Channel Bottom Flange – 7% Loss
- Exterior Channel Top Flange – 37% Loss
- Overall Section Loss – 25%

Span 23 Deck Truss – L8W Bottom Chord Interface to Gusset:

Readings not taken of channel flanges or of exterior channel. Assume loss is 17% overall based on interior channel web.

- Interior Channel Web – 17% Loss

Recommendation: The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high

despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

3. An underwater inspection was performed in 2012. The channel bottom has undergone significant changes since 2008. Localized scour and channel bottom degradation was observed in the vicinity of the bridge, resulting in an increase in extent of the foundation exposure at Piers 19 and 20. At Pier 19 the vertical footing exposure increased 1.5 feet to full height (5.5 feet) of footing exposure, along with some seal exposure. In addition, foundation undermining (3 feet high) has developed at the pier and five exposed timber piles were encountered. Overall channel drop of 13 feet was noted since 2008. Due to these developments, the consultant returned to the bridge at a later date equipped with an underwater acoustic imaging system. Given the overall size of Pier 19, and the large number of foundation piles, the current conditions do not significantly affect the pier's structural stability. The amount of channel bottom change warrants countermeasures, and in the interim demands careful monitoring. Refer to the 2012 Underwater Inspection report in Appendix D for further details and photos.

Recommendation: The MnDOT Bridge Office met on October 18, 2012 to discuss the findings. It was determined that the frequency of routine underwater inspections will remain at 48 months. More frequent underwater inspections may be performed on a case-by-case basis, as warranted by significant flood events and other situations that result in pile exposure. These will be coordinated through MnDOT District 6 and the Bridge Office Hydraulics Unit. The MnDOT scour monitoring equipment mounted on Piers 19 and 20 provides real-time information on water level, channel depth and other data that are accessible online (Appendix E). The data will show when scour causes the footing to be undermined and piles exposed. For example, current data shows that the scour hole exposing the Pier 19 piles has already started filling back in. The current plan for bridge improvement calls for rehabilitation of the existing bridge, along with construction of a second bridge directly upstream. For this reason, there are no immediate plans to place riprap around the existing footings, as it might need to be removed to facilitate the new construction. Scour around the existing piers will be carefully monitored during construction of the new bridge substructures, as scour patterns may change. The NBI rating was recommended to go from 6 to 5, and a concrete pier footing element should be added. This will be completed via an Update Report in SIMS once this Fracture Critical Report is approved.

4. Weigh-in-Motion sensors were installed by Cy-Con Inc. in the pavement on the bridge on October 27, 2009 that collects traffic data including number, type, and weight of vehicles. The most recent analysis of the data was in the 2010 Fracture Critical Report. More recent data will be provided via an Update Report in SIMS once complete.

Recommendation: The Bridge Office will complete analysis of the data over the past two years and provide to the District via an Update Report.

Pictures



Photo 55 - 55 Span 18 L4W Inside Interior Plate North Corrosion

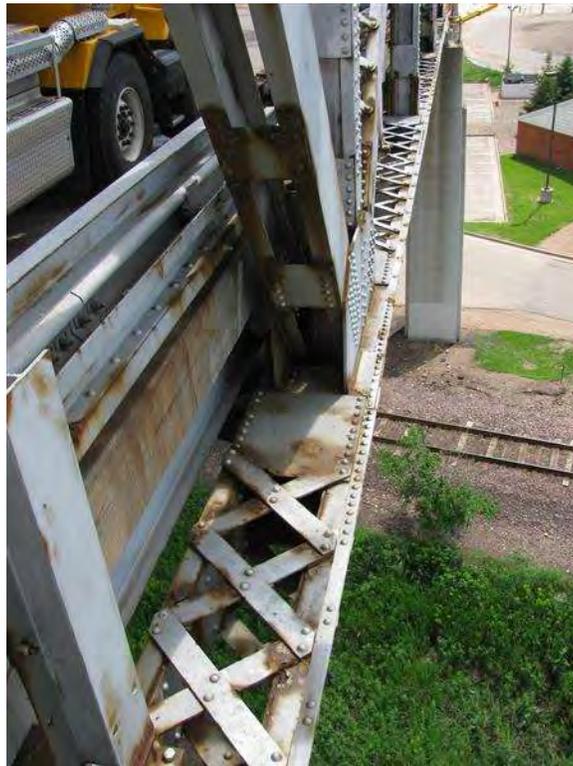


Photo 56 - 56 Span 18 L4-U5W Typical Corrosion

Pictures



Photo 57 - 57 Span 18L4-L5W Between Bottom Chord Channel Corrosion and Pack Rust Typical Looking South



Photo 58 - 58 Span 18 L5-L6E Interior Channel Corrosion at L6E North

Pictures



Photo 59 - 59 Span 18 L5-L6E Bottom Chord Corrosion and Pack Rust Looking South



Photo 60 - 60 Span 18 L6W Inside Interior Plate South Losses

Pictures



Photo 101 - 101 Span 19 FB 11 Bottom Flange Corrosion



Photo 102 - 102 Span 19 Stringer 1 at L12W

2014 7 DAY FC
BRIDGE INSPECTION REPORT



BRIDGE # 5900
TH 43 over MISS RVR, RR, STREETS

DISTRICT: District 6 COUNTY: Winona CITY/TOWNSHIP: WINONA

Date(s) of Inspection: 06/02/2014 - 06/05/2014
Equipment Used: A-62, A-62, A-62, Other - 80' Lift

Owner: State Highway Agency

Inspected By: Evens, Eric; Fishbein, Joseph; Nelson, Bill; Potter, Farrell;
Rand, Ken; Theisen, Scott; Waletzki, Gary; Zink, Jennifer

Report Written By: Jennifer Zink
Report Reviewed By: Jennifer Zink
Final Report Date: 08/19/2014

MnDOT Bridge Office
3485 Hadley Avenue North
Oakdale, MN 55128



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MnDOT Structure Inventory Report

Bridge ID: 5900

TH 43

over MISS RVR, RR, STREETS

Date: 08/19/2014

GENERAL	
Agency Br. No.	
District	District 6
Maint. Area	6A Crew
County	085 - Winona
City	WINONA
Township	
Desc. Loc.	2.8 MI N OF JCT TH 61
Sect., Twp., Range	22 - 107N - 07W
Latitude	Deg 44 Min 3 Sec 27.36
Longitude	Deg 91 Min 38 Sec 23.2
Custodian	01 - State Highway Agency
Owner	01 - State Highway Agency
BMU Agreement	
Year Built	1941
MN Year Reconstructed	1985
FHWA Year Reconstructed	1985
MN Temporary Status	
Bridge Plan Location	1 - CENTRAL
Date Opened to Traffic	8/1/1986
On-Off System	1 - ON
Legislative District	31A

STRUCTURE	
Service On	5 - Highway-pedestrian
Service Under	8 - Highway-waterway-railroad
Main Span Type	
	4 - Steel Continuous 03 - High Truss
Main Span Detail	E - WARREN W/VERT
Appr. Span Type	
	4 - Steel Continuous 04 - Deck Truss
Appr. Span Detail	E - WARREN W/VERT
Skew	0
Culvert Type	
Barrel Length	ft.
Cantilever ID	S - Pin and Hanger

NUMBER OF SPANS	
MAIN: 3	APPR: 21 TOTAL: 24
Main Span Length	450.0 ft.
Structure Length	2281.5 ft.
Deck Width (Out-to-Out)	34.4 ft.
Deck Material	1 - Concrete Cast-in-Place
Wear Surf Type	1 - Monolithic Concrete (concr
Wear Surf Install Year	
Wear Course/Fill Depth	ft.
Deck Membrane	0 - None
Deck Rebars	1 - Epoxy Coated Reinforcing
Deck Rebars Install Year	1985
Structure Area (Out-to-Out)	78611 sq. ft.
Roadway Area (Curb-to-Curb)	70945 sq. ft.
Sidewalk Width	Lt 5.00 ft. Rt 4.50 ft.
Curb Height	Lt 0.67 ft. Rt 0.67 ft.
Rail Type	Lt 43 Rt 43

ROADWAY	
Bridge Match ID (TIS)	1
Roadway O/U Key	Route On Structure
Route Sys	03 - MNTH Number 43
Roadway Name or Description	MN 43
Level of Service	1 - MAINLINE
Roadway Type	2 - 2-way traffic
Control Section (TH Only)	8503
Reference Point	044+00.892
Detour Length	65.0 mi
Lanes	On 2 Under 6
	ADT 11900 Year 2004
HCA DT	476 ADTT 4 %
Functional Class	14 - Urban - Other Principal Art

RDWY DIMENSIONS			
If Divided	NB-EB	SB-WB	
Roadway Width	31.00 ft.		ft.
Vertical Clearance	17.9 ft.		ft.
Max. Vert. Clear.	17.9 ft.		ft.
Horizontal Clear.	30.9 ft.		ft.
Lateral Clearance			ft.
Appr. Surface Width	31.0 ft.		
Bridge Roadway Width	31.0 ft.		
Median Width On Bridge			ft.

MISC. BRIDGE DATA	
Structure Flared	0 - No flare
Parallel Structure	N - No parallel structure
Field Conn. ID	2 - Riveted
Abutment Foundation	1 - CONC
(Material/Type)	1 - SPRD SOIL
Pier Foundation	1 - CONC
(Material/Type)	1 - SPRD SOIL
Historic Status	2 - Eligible for National Register

PAINT	
Year Painted	1993
Unsound Paint %	30
Painted Area	239130 sq. ft.
Primer Type	2 - Lead, Iron Oxide - non
Finish Type	F - - Phenolic Resin Alum

BRIDGE SIGNS	
Posted Load	2 - Vehicle & Semi
Traffic	0 - Not Required
Horizontal	0 - Not Required
Vertical	0 - Not Required

INSPECTION	
Userkey	21
Unofficial Structurally Deficient	Y
Unofficial Functionally Obsolete	N
Unofficial Sufficiency Rating	24.3
Routine Inspection Date	06/05/2014
Routine Inspection Frequency	12
Inspector Name	Bridge Office FC Unit A
Status	P - Posted for Load

NBI CONDITION RATINGS	
Deck	5 - Fair Condition
Unsound Deck %	35
Superstructure	4 - Poor Condition
Substructure	5 - Fair Condition
Channel	4 - Protect; Sev. undermined; S
Culvert	N - Not Applicable

NBI APPRAISAL RATINGS	
Structure Evaluation	4
Deck Geometry	4
Underclearances	3
Water Adequacy	8 - Bridge Above Approache
Approach Alignment	6 - Equal to present minimu

SAFETY FEATURES	
Bridge Railing	1 - MEETS STANDARDS
GR Transition	1 - MEETS STANDARDS
Appr. Guardrail	1 - MEETS STANDARDS
GR Termini	1 - MEETS STANDARDS

IN DEPTH INSP.			
	Y/N	Freq	Date
Frac. Critical	Y	24 mo.	06/05/2014
Underwater	Y	60 mo.	08/16/2012
Pinned Asbly.	Y	24 mo.	06/20/2012
Spec. Feat.			

WATERWAY	
Drainage Area (sq. mi.)	
Waterway Opening	99999 sq. ft.
Navigation Control	1 - Nav. control on waterway
Pier Protection	1 - Not required
Nav. Clr. (ft.)	Vert. 63.0 ft. Horiz. 438.0 ft.
Nav. Vert. Lift Bridge Clear. (ft.)	
MN Scour Code	R - CRIT - MONI Year 2011

CAPACITY RATINGS	
Design Load	3 - HS 15
Operating Rating	2 - AS HS 21.6
Inventory Rating	2 - AS HS 11.4
Posting VEH: 40	SEMI: 40 DBL: 40
Rating Date	7/28/2008
MnDOT Permit Codes	
A:	X - Denied
B:	X - Denied
C:	X - Denied

7 Day Fracture Critical Report (Report Date: 08/19/2014)

Disclaimer: The condition ratings in this report are only suggested. It is the responsibility of the Bridge Owner to approve inspection data in SIMS.

Bridge #: 5900
 Facility Carried: TH 43
 Facility Intersected: MISS RVR, RR, STREETS
 Bridge Owner: State Highway Agency
 Inspection Date(s): 06/02/2014 - 06/05/2014
 Primary Inspector: Zink, Jennifer
 Other Inspector(s): Evens, Eric; Fishbein, Joseph; Nelson, Bill; Potter, Farrell; Rand, Ken; Theisen, Scott; Waletzki, Gary
 Method of Access: A-62, A-62, A-62, Other - 80' Lift
 Traffic Control: Provided by District 6 Traffic Control Services
 Scope of Inspection: Routine and Fracture Critical

Critical Structural Deficiencies (Yes/No) No
 New Load Rating Recommended (Yes/No) No
 Traffic Safety Hazard (Yes/No) No
 Structural Analysis Recommended (Yes/No) No

NBI Condition Ratings			
Item	Current	Suggested	Comments
Deck	5	5	[2014] No significant change. Updated the Unsound deck percentage as there is a lot of current and previous delaminations removed on the underside of the deck. Changed to 5 in 2010 due to extensive cracking, leaching, and areas of under-deck delamination.
Superstructure	4	4	[2014] No significant change in respect to the NBI rating. Changed to 4 in 2010 due to severe deterioration of steel truss members in both the main and deck truss spans with section loss over a range of 20-50%. Numerous repairs completed in 2010 as a result.
Substructure	6	5	[2014] NBI dropped to 5 during this inspection due to the undermining of the river piers and the continued deterioration (cracking-spalls-patches) of the North Abutment due to erosion of the slope paving. NBI of 6 since 1999.

Channel	5	4	<p>[2014] NBI rated down to 4 from 5 since 2012 due to the increased frequency at which the engineer recommended underwater inspections. Significant channel change has occurred since 2008. See 2012 underwater inspection report for details (attached to this report). As part of the rehabilitation study, scour monitoring and an underwater inspection is planned for this summer/fall. Countermeasures will be placed at the river pier footings in the fall. Once this is complete, the NBI may be upgraded to 5.</p> <p>Changed to 6 in 2010 due to exposed pier footings and scour depressions as identified in the 2008 underwater inspection.</p> <p>NBI rating lowered due to results of underwater inspection report showing a scour hole, 20 feet in diameter and 5 to 8 feet deep, at the upstream nose of Pier 20. A 75 foot wide by 30 foot long scour depression was observed at the upstream nose of Pier 19. The depression was approximately 5 to 13 feet deep relative to the adjacent channel bottom. The entire north half of the footing at Pier 18 was exposed with 2 feet of vertical exposure at the NE corner, 1.0 foot of exposure at the midpoint, and 3.0 feet of vertical exposure at the NW corner. The footing was exposed around the entire perimeter of Pier 19. The seal was exposed from the downstream 1/4 point on the south face, around the upstream nose, to the mid-point on the north face. There was 3 feet of vertical undermining and 12 to 15 feet of penetration beneath the seal at the upstream end of the pier. There are five exposed timber piles beneath the seal of the pier. The footing was exposed around the upstream end and down to the midpoint on each side of Pier 20 with maximum vertical exposure of 5.5 feet (full height of footing). The seal was partially exposed at the upstream nose with a maximum vertical exposure of 3 feet. No foundation undermining was observed at Pier 20.</p>
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Suggested Element Condition Rating Changes in RED

#	Element Description	Quantity	Element Condition Ratings				
			1	2	3	4	5
022	Low Slump O/L (Concrete Deck with Uncoated Rebar)	12,082 SF	0	12,082	0	0	0
026	Top of Concrete Deck (No Overlay - Epoxy Rebar)	64,106 SF	0	64,106	0	0	0
107	Painted Steel Girder or Beam	785 LF	220	360	200	5	0
109	Prestressed Concrete Girder or Beam	421 LF	417	4	0	0	
110	Reinforced Concrete Girder or Beam	1,686 LF	1,429	240	17	0	
113	Painted Steel Stringer	12,593 LF	3,585	5,500	3,200	298	10
121	Painted Steel Through Truss - Bottom Chord	1,867 LF	0	0	0	1,572	295
126	Painted Steel Through Truss - Upper Members	1,867 LF	0	700	1,040	127	0
131	Painted Steel Deck Truss	1,560 LF	0	0	650	900	10
152	Painted Steel Floorbeam	3,315 LF	0	1,657	1,300	356	2
161	Pin & Hanger (or Hinge Pin) Assembly (Painted)	12 EA	0	4	4	4	0
205	Reinforced Concrete Column	49 EA	22	20	7	0	
210	Reinforced Concrete Pier Wall	211 LF	111	89	11	0	
215	Reinforced Concrete Abutment	79 LF	35	5	39	0	
234	Reinforced Concrete Pier Cap	840 LF	551	270	19	0	
300	Strip Seal Deck Joint	372 LF	356	16	0		
301	Poured Deck Joint	1,085 LF	1,060	17	8		
303	Assembly Deck Joint (with or without seal)	93 LF	0	93	0		
310	Elastomeric (Expansion) Bearing	35 EA	32	3	0		
311	Expansion Bearing	49 EA	28	21	0		
313	Fixed Bearing	37 EA	14	23	0		
321	Concrete Approach Slab-Concrete Wearing Surface	2 EA	1	1	0	0	
334	Metal Bridge Railing (Coated or Painted)	1,867 LF	929	652	285	0	0
357	Pack Rust Smart Flag	1 EA	0	0	1	0	
358	Concrete Deck Cracking Smart Flag	1 EA	1	0	0	0	
359	Underside of Concrete Deck Smart Flag	1 EA	0	0	1	0	0
360	Substructure Settlement & Movement Smart Flag	1 EA	0	1	0		
361	Scour Smart Flag	1 EA	0	1	0		

Suggested Element Condition Rating Changes in RED							
#	Element Description	Quantity	Element Condition Ratings				
			1	2	3	4	5
363	Section Loss Smart Flag	1 EA	0	0	0	1	
377	Low Slump O/L (Concrete Deck with Epoxy Rebar)	2,423 SF	0	2,423	0	0	0
380	Secondary Structural Elements	1 EA	0	1	0	0	
387	Reinforced Concrete Wingwall	2 EA	0	2	0	0	
409	Chain Link Fence	3,630 LF	0	0	3,630	0	0
422	Painted Beam Ends	8 EA	0	0	8	0	0
423	Gusset Plate Truss Connection - Painted Steel	320 EA	55	120	140	5	0
964	Critical Finding Smart Flag	1 EA	1	0			
966	Fracture Critical Smart Flag	1 EA	0	1	0		
967	Gusset Plate Distortion Smart Flag	1 EA	0	1	0	0	
981	Signing	1 EA	1	0	0	0	0
982	Approach Guardrail	1 EA	1	0	0		
984	Deck & Approach Drainage	1 EA	0	1	0		
985	Slopes & Slope Protection	1 EA	0	1	0		
986	Curb & Sidewalk	1 EA	0	1	0		
988	Miscellaneous Items	1 EA	0	1	0		

Element Rating Notes:

ELEMENT #022: Element was added to reflect deck revision completed in 1985. A 2" low slump overlay was added in Spans 3 to 14 of the existing deck that was not removed for widening.

[2014] No significant change; about 50% top of deck spalls repaired during this inspection.

[2013] No significant changes from the 2012 Inspection.

[2012] Spans 3 thru 9 - Have a few scattered delaminated areas associated along the transverse deck cracks.

Span 10 - Has a few scattered delaminated areas associated along the transverse deck cracks.

Spans 11 thru 14 - Have a few scattered delaminated areas associated along the transverse deck cracks.

Span 14 - Has a few scattered delaminated areas associated along the transverse deck cracks 2 spalls 4sq ft.

ELEMENT #026: Element was revised to reflect deck revision completed in 1985. This part of the deck includes Spans 1 and 2 and Spans 15 to 24.

[2014] No significant change; however, condition state revised to reflect unsound wearing surface as delaminations and patches have been reported previously. About 50% top of deck spalls repaired during this inspection.

[2013] No significant changes from the 2012 Inspection.

[2012] Span 1 - The south bound lane has 8 separate patched areas that nearly blend together near the center line which range in size from 2' x 4" to 4' x 6'. There is a 1' x 2" spalled area with exposed rebar between the patches.

Span 2 - Has a few scattered delaminated areas associated along the transverse deck cracks.

Span 15 - Has 10 patched areas along the north bound lane ranging in size from 1' x 1' to 2' x 2'.

Span 16 - Has a 10" x 10" patched area along the north bound lane near the center line over pier 15.

Span 17 - Has a small 6" x 24" patched area along the south bound lane next to the assembly joint and a small 4" x 6" spalled area along the south bound lane 10' to the south of the assembly joint.

Span 18 - Has a small 3" x 3" spalled area along the north bound lane 90' to the south of pier 18.

Span 19 - Has 4 patched areas along the assembly joint in the north bound lane and 1 in the south bound lane. The south bound lane has a 1' x 3' patched area with delaminated concrete located 30' south of the assembly joint and a 1' x 1' spalled area near the fog line 70' south of pier 19.

Span 20 - Has a small 1' x 2' patched area in the south bound lane near pier 19.

Span 21 - Has 5 patched area along the north bound lane, 2 near the north end and 3 along the expansion joint.

Span 22 - OK.

Span 23 - Has 2 patched areas along the north bound lane.

Span 24 - Has 4 patches areas along the north bound lane and 2 small 6" x 6" spalled areas along the south bound shoulder.

ELEMENT #107: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] The paint system is mostly sound with some scattered areas of active corrosion and minor loss of section.

Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #109: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] There is one prestressed concrete girder located on the east side of the bridge in Spans 3 thru 14. In Span 11, there are small chips along the end of the girder over Pier 11. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #110: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] These concrete cast in place T-girders are located in Spans 3 thru 14. There are scattered girders with vertical and random cracks and small patches. Span 13 - The west fascia girder has a small area of spalling near the mid span. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #113: [2014] Span 19 Stringer 1 at Floorbeam 12 West web continues to show increased through-corrosion (Photos 1-2). No web crushing is evident. Other areas of web through corrosion have developed in other stringers in the through truss spans - Span 18 Stringer 1 L8W, Span 18 Stringer 6 L8E, Span 19 Stringer 2 FB11, and Span 19 Stringer 5 L18'E (Photos 3-10) - add 8 more feet to CS5. No web crushing; therefore, structural analysis is not needed at this time since the stringer load rating factors are high. Fascia stringers along Spans 18-20 are heavily corroded along the bottom flange at the floorbeam connections up to 3/8" loss (Photos 11-12). Surface corrosion is present along entire length of fascia stringers (Photo 13).

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Span 19 Stringer 1 at Floorbeam 12 West has numerous through corrosion in web for 2 feet (Photo 7). No web crushing evident. Areas where the holes are nominal in thickness. The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #121: [2014] Entire lower chord of main truss spans 18-20 up through the splash zone is CS4 due to extensive flaking and pack rust with notable loss of section mainly near gusset plate locations (Photos 14-17). Many batten plates and lacing bars have through corrosion (Photo 18). Notable locations of loss recorded include: Span 19 L15-L16E at L16SE (Photos 19-20) up to 30% web loss and up to 20% flange loss but with likely an overall section of loss equal to less than 20% (typical for more of the bottom chord members of this type); Span 19 L12'-L13'W 15.3% overall loss (Photos 21-23). Analysis was completed by the MnDOT Bridge Office for these locations - L15-L16 can take losses up to 40-50% overall before affecting the current posting; L12-L13 is approaching the threshold of a posting revisions and/or repair. Close monitoring of these locations during each inspection must be noted and reported to the Bridge Office immediately if additional losses are incurred. These entire chord sections (6 segments total) are rated CS5. Losses noted at the locations in 2012 have not changed significantly, but quantity will remain in CS5.

[2012] Two bottom chord-to-gusset interface locations exhibit significant section loss:

1.Span 18 Main Through Truss – L0-L1W at L0W Gusset Interface:

Interior Channel Web – 27% Loss

Interior Channel Bottom Flange – 19% Loss

Interior Channel Top Flange – 23% Loss

Exterior Channel Web – 20% Loss

Exterior Channel Bottom Flange – 7% Loss

Exterior Channel Top Flange – 37% Loss

Overall Section Loss – 22%

2.Span 20 Main Through Truss – L0'-L1'E at L0'E Gusset Interface:

Section loss calculated at 42% Loss in Channel Web Interior – no measurements taken at this location of channel flanges or Exterior Channel. Assume losses similar to Span 18 location above:

Interior Channel Web – 42% Loss

Interior Channel Bottom Flange – 19% Loss

Interior Channel Top Flange – 23% Loss

Exterior Channel Web – 20% Loss

Exterior Channel Bottom Flange – 7% Loss

Exterior Channel Top Flange – 37% Loss

Overall Section Loss – 25%

The Bridge Office analyzed these locations on 6/22/2012, and the rating factors remain very high despite the loss. No emergency repairs required. The Bridge Office will determine a maintenance plan with the District.

ELEMENT #126: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] All of the top members have areas of failed paint with active corrosion, the vertical and diagonals along the splash zone areas have areas of minor loss of section and pack rust forming along all faying surfaces. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #131: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Pack rust, paint failure, and surface corrosion have advanced between lacing and batten plates, chords, verticals, and diagonals - especially in those areas where drains were not extended prior to 2009. Severe corrosion along the bottom chord in multiple areas will require analysis. This was reported to the Bridge Office in 2010. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #152: [2014] Floorbeams at all panel point connections exhibit heavy corrosion with loss of section mainly in the web areas such as FB11'W in Span 19 reported in 2012 - but not to that extent in most areas (Photos 24-25); CS4 for 4' each end for 39 beams. Most notable during this inspection was FB12W in Span 19 (Photo 26) - localized we loss of 65-81% around the fascia stringer connection (CS5: added 1 LF). All floorbeam connections should be monitored and recorded closely during every inspection for continued loss. Most floorbeams also exhibit surface corrosion along the entire bottom flange and pitting on the top of the bottom flange near connections (Photos 27-28). As such, condition ratings are adjusted so that no CS1 exists at this point - moved remaining quantity to CS2.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] There is 82% loss of section to the web of FB11' W at the stringer connection in Span 19. This condition was reported to the Bridge Office in 2010. Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #161: [2014] All pins tested ultrasonically during the 2014 inspection using a regular transducer, not composite. Indication on the false member pins at U16'-U15'E which has been previously noted but not documented thoroughly in 2007 likely due to wear: U16'E pin at 6:00 at 7-10% 12" from the inside face only; U15'E pin at 1:00 at 60% at 20" both from the inside and outside faces. Pins exhibit slight paint failure and surface corrosion. No other changes.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] There are upper and lower pins at U15 and U15', along with the bottom chord pins of the false members at L14-L15 and L15'-L14' and the top chord pin at U15-U16 and U15' and U16', in both trusses of Span 19. U15 and U15' East and West pins exhibit extensive wear of up to 1/2" (CS4). This condition was reported to the Bridge Office in 2010. All pins were ultrasonically inspected in 2010 and 2012.

[2007] Indication on inside of top pin at U15-U16W expansion pin - 5 3/4" from interior face 11:00 to 1:00 position and 6 1/2" from the exterior face from the 11:00 to 12:00 position. U15 and U15' E and W pins have up to 1/2" of wear. L15'W pin indicates wear at top of pin 8.5" and 12" from outside face. L15'E pin indication at top only 9.4".

[1997] U15E pin replaced after UT inspection indicated a possible crack; none was found upon removal.

ELEMENT #205: [2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] Pier 1 Column 1 has small horizontal cracks on the east face of the column and a 4" x 8" cracked and delaminated area on the south side. Columns 2, 3, and 4 have horizontal cracks on the south face of the column. Column 4 has a small spall at the northeast corner. Pier 2 Columns 1 and 2 have small spalls along the NW steel corner plate. Column 3 has a delaminated area on the north side approximately 6 square feet in size, a 3" deep x 1' spalled area on the south face near the steel angle, and a 32" x 22" x 3.5" deep spall along the west side above the steel corner angles. Pier 5 Column 1 has random horizontal cracking and rust staining near the top with a 2' x 2' area of delaminated concrete on the west side. There is a 2' long vertical crack with an area of delaminated concrete near the top on the east side of the column. On Column 1, there is random cracking on the south face and a 2' x 3' area of cracked and delaminated concrete on the north face. Column 2 has an area of random cracking along the west side at the bottom edge. Both columns of Pier 8 have vertical cracks and rust staining near the bottom at the outside corners. Column 1 has an area of random cracking near the top on the north side with delaminated concrete. On the south side of column 1 there is a 1' x 1' area of delaminated concrete 2' from the bottom. Pier 11 - both columns have vertical cracks and rust staining near the bottom at the outside corners. Column 1 has an area of random cracking near the top on the north side with possible delaminated concrete. Pier 12 has scattered horizontal and vertical random cracks on the south sides of both columns. There is a 3" Ø spall on the east side of Column 2 and a 2" Ø spall on the west side of Column 1. Pier 13 Column 1 has a 4" x 3" rebar spall on the west side located approximately 15' up from the bottom. Pier 14 has scattered horizontal and vertical random cracks near the corners of both columns. Column 1 has a small spall near the bottom on both the north and south sides. Pier 15 Column 1 has a vertical crack along the east side. There is a small rebar spall on the east side of Column 2 approximately 10 feet above the ground line. Both columns of Piers 16 and 17 have some scattered vertical, horizontal and random cracks. Both columns of Pier 18 have some scattered vertical cracks. Column 2 has a 3' vertical rebar spall on the inside face near the bottom. Pier 19 has a long vertical crack and two horizontal rebar

spalls on the west sides of the east column. Pier 20 has a spall in the west column 10' from the top 1'x2'; small spall under east bearing. Column 2 has a horizontal crack and small spall near the bottom on the west side next to lower pier wall. Pier 22 Column 2 has a corner spall and area of delaminated concrete. Column 1 shows little to no deterioration only superficial cracking at this time. Pier 23 Column 1 has scattered random cracks and a small rebar spall near the bottom on the west side. Column 2 has a vertical crack on the west side.

ELEMENT #210: Pier walls located at Piers 18,19, and 20.

[2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] There are numerous horizontal and vertical cracks on both sides of the Pier 18. There is a 5' long horizontal crack at the east end near the top. There is a patched area extending completely around the pier. There are a few scattered vertical cracks on both sides of Pier 19 and open random cracks on the top surface between the columns. There is a patched area extending completely around the pier. There is an open crack across the top of the wall of Pier 20 approximately 10' from Column 1; the crack is open as much as 1½". There are a few scattered vertical cracks on both sides of the pier and there are open random cracks with some staining on the top surface between the columns. There is a patched area extending completely around the pier. In 1993, all loose and deteriorating concrete was removed to the reinforcement bars approximately 5' above and 5' below the water for all piers. After concrete removal, the lower base was re-poured with new concrete.

ELEMENT #215: [2014] The North Abutment has a full through vertical crack under Stringer 5 (Photo 36). The entire abutment as a whole continues to deteriorate from movement due to erosion of the slope paving. All of the North Abutment should be in CS3.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] South (Minnesota) Abutment - Has 3 vertical or random cracks scattered across the front face and a 6" X 18" delaminated area under Girder 3. North (Wisconsin) Abutment - There are a few scattered vertical or random cracks in the front face most extending across the bridge seat and up the parapet wall with some staining. The parapet wall has patched areas at both ends and full length horizontal or random cracks.

ELEMENT #234: NOTE: Survey targets have been placed on the top outside portions of Piers 16 and 17. Tilt meter has been placed on Pier 20.

[2014] There is moderate block cracking on Pier 18 cap (add 44 LF CS2); Pier 19 has minor horizontal cracks in the south face (remain in CS1). Past data as noted below has not changed. Survey data from the District for the past several years indicates that the piers are not moving significantly.

[2013] Survey targets also placed on Piers 19, 20.

[2012-previous] All deficiencies noted here are CS3 (19LF) except for cracking which is CS2. Pier 2 cap has spalls with exposed rebar. Pier 4 cap has two minor chips and a small scrape along the bottom east end. Pier 5 south side of cap has two areas of delaminated concrete located at the center line of the west of Column 2. Pier 8 has cracking along the top of the pier cap. Pier 11 cap has delaminations present at mid-span; 1'x1' area on the south side located under Girder 4; vertical crack near center located along both sides that extends to the bottom of the cap with a 1'x1' delaminated area on the bottom; north side of cap has 1'x1' area of random cracking with a delaminated area located between Girders 1&2. Pier 14 has spalling at center of cap and map cracking along the west side by the bearing; 3'x4' spall and a 3'x3' spall directly above the bigger spall on the south side of the cap near the centerline; west end of cap has 3'x3' area of random cracking with staining and leaching. Pier 17 has two spall 3"x3" and 6" x6" along the south face of the cap. Pier 20 south face cap has a 6"x18" spall along the wind anchorage edge.

ELEMENT #300: [2014] No change in condition state.

[2013] Strip Seal Joint gap measurements: No significant changes from the 2012 Fracture Critical Inspection.

[2012] Joint Over Pier 5 - There was 2' of gland out along the north bound lane and 4' of gland out along the south bound lane for a total of 6' out. Joint Over Pier 8 - Has 2' of gland out along the south bound lane near the fog line. Joint Over Pier 11 - Has 2' of gland out along the north bound lane near the center line. Joint Over Pier 15 - Has 2' of gland out along the north bound lane. Joint Over Pier 16 - Has 1' of gland out along the south bound lane near the fog line. Joint Over Pier 22 - Has a 2' long patched area along the south bound lane. Joint Over North (Wisconsin) Abutment - Has 1' of gland out.

ELEMENT #301: [2014] No change.

[2013] There are approximately 25 linear feet of joint material that has lost adhesion. [2013] Small spalls along pourable joints. There is a 22"x6" spall in pourable joint 25 ft south of Pier 18.

ELEMENT #303: [2014] All 3 steel assembly joints have full length active corrosion. Joint at Pier 20 is noisy. No change in condition state.

[2013-previous] Joint Over Pier 20 - The south bound plate was loose and is 1/4 to 1/2 inch lower than the concrete deck.

ELEMENT #310: Elastomeric bearings were put on the approach spans for the multi-beams in Span 2 in 1985,

under the new pre-stressed girders at the east fascia in Spans 3-14 in 1985 and the deck truss at Pier 22 north side in 2005.

[2014] Pier 22 bearings have crept out further (Photo 35). The Winona bridge crew installed retainers at this location during this inspection. The elastomeric bearing under the prestressed concrete beam is walking out on Pier 14, and that will be reset at some point in the late summer or early fall of 2014. Condition states for these 3 bearings is CS2.

[2013] Pier #22 – The Elastomeric Bearing Pad is creeping out from under the plate. Plate measures 28"x20" and the Elastomeric Bearing Pad measures 26"x18". The pad measurements were taken along the north side of the bearing assembly. Both Bearing Pads also appear to be in a neutral position. West Truss Bearing: The west and east side of the pad is out from under the plate ¼ " (1 ¼" out of alignment). The pad is also out of alignment 3/8" to the west.

East Truss Bearing: The west side of the pad is out from under the plate 1 ¼ " (2 ¼" out of alignment), the east side is out 3/4" (1 3/4" out of alignment). The pad has also shifted 1/8" to the east. The east side elastomeric bearing pad at the area between the steel beam and the first concrete girder has shifted outwards 1/2 of an inch under the steel plate.

ELEMENT #311: [2014] Rocker link anchorage bearing on Pier 20 has one nut that is half gone. Since..

[2013] No significant changes from the 2012 Fracture Critical Inspection.

There is a total of 3 expansion bearings on Pier 15 south for the 3 plate girders and 4 total rocker link anchorage bearings - 2 at Pier 17 north side and 2 at Pier 20 south side. Other expansion bearings are on the main truss Piers 18 and 19, the rocker bearings on the deck truss spans and bituminous felt bearings under the original 4 concrete girders in approach Spans 3 -14.

ELEMENT #313: [2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] North (Wisconsin) Abutment Bearings - Both bearings have failed paint with active corrosion.

ELEMENT #321: [2014] Rate north approach in CS2 - cracking and raveling at the poured joints at the north end.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] South (Minnesota) Approach Slab - There is a 1' x 3' long cracked and delaminated area along the east curb. North (Wisconsin) Approach Slab - There are sealed random cracks and a 10" x 15" spalled and delaminated area along the east curb.

ELEMENT #334: [2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] There are scattered areas along the upstream railing that have fading and failing paint, surface corrosion and pack rust along all of the faying surfaces and minor loss of section.

The downstream side has the galvanized tri-beam guardrail, the galvanizing is starting to break down slightly.

ELEMENT #357: [2014] Pack rust noted in main through truss spans mainly in the connection areas of the bottom chord to gusset to floorbeam areas - pack rust typically 1/2" in bottom chord/floorbeam/gusset areas; up to 1" at the bottom horizontal gusset plate lateral bracing connections.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] Most steel members with faying surfaces have pack rust showing with some areas having rust between the plates that has caused serious distress at the connection, however all connections are still intact. Pack rust up to 1" can be found on the deck truss lower chord built up channels and plates. Deck truss gusset plates horizontal surface exhibit up to 3/4" pack rust.

ELEMENT #358: [2014] No change.

[2013] Approximately 19,000 linear feet of deck cracks were sealed in 2012.

ELEMENT #359: [2014] Additional delaminations noted in the main through truss spans 18-20. The bridge crew continues to remove delaminations as needed.

[2013] No significant changes from the 2012 Fracture Critical Inspection. Additional minor spalls and locations reported to the Winona Bridge Crew Supervisor.

There are scattered areas of transverse cracks with efflorescence and leaching beneath the deck. There are scattered small holes rusted completely through the stay in place metal forms. There are numerous areas of delaminations present. These delaminations are more prevalent on the Minnesota end of the truss. The total distressed area is more than 2% of the deck area. The amount of delaminations is continuing to worsen on a yearly basis.

The Winona Bridge Crew removed under deck delaminations in 2009, 2010, 2011, 2012.

ELEMENT #360: [2014] Survey targets also placed on Piers 19 and 20; tilt meter on Pier 20. All data provided by the District so far has indicated minimal to no movement. The North Abutment continues to crack due to movement caused by erosion of the slope paving - CS2.

[2013-previous] Strain gauges and survey targets have been set at Piers 16 and 17. The strain gauges indicate

some stress due to fixity. This may be due to frozen bearings. As such, pier movement may be allowing the bridge to expand and contract.

ELEMENT #361: [2014] Condition downgraded to CS2 until countermeasures are in place - see NBI Channel notes. [2013] Refer to the underwater inspection performed in 2012 by Collins Engineering. [2011] R - Scour critical. Monitoring required.

ELEMENT #363: [2014] Section loss has advanced in the bottom chord and gussets of the main through truss. All notable locations analyzed for load capacity by the Bridge Office are adequate. See notes for elements 121 and 423.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012-previous] Section loss has advanced since the 2008 fracture critical inspection and the 2009 annual inspection. A number of areas exhibit severe section loss in critical areas. All of these areas have been reported to the Bridge Office for analysis. Span 22 L8W and Span 21 L0E section loss has triggered the "Critical Finding".

ELEMENT #377: [2014] The combined unsound wearing surface is less than 2% of the total deck area. No change from previous years.

Added element to reflect 1985 deck revision. In Spans 3 to 14 the deck was widened 5'9". See element 22 notes.

ELEMENT #380: This element was added for the truss portal, sway and lateral bracing and diaphragms. Minor paint system failure. present.

[2014] The U16' sway frame has through corrosion at U16'W - 1" diameter.

[2013] There are a few lateral wind bracing center hangers that have broken off at the top anchorage. Span #19, center hanger #3, between FB #12 and #13, north of Pier #18. Span #20, center hangers #3, #4, #5, between FB #2 and FB #5, south of Pier #20.

ELEMENT #387: The wingwalls are located at the Wisconsin end only; the South Abutment has retaining walls.

[2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Northeast Wingwall - Has a few vertical rebar spalls along the front face and a 4" X 72" spalled area along the top edge with exposed rebar. Northwest Wingwall - Has scattered random cracks with some leaching or staining.

ELEMENT #409: [2014] Some areas of the fence are in need of repair. The District 6 bridge crew took inventory of these needs during the inspection and will determine a future date for repairs and how extensive they will be. All rated in CS3 until further information is gathered. Repairs are not immediate.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] New chain link fence was installed along the sidewalk side in 2008. All of the fencing is intact with little to no deterioration.

ELEMENT #422: [2014] This element corresponds with paint condition of steel superstructure located within 7 ft on either side of a transverse deck joint, which are located at Piers 14-17 and 20-23. All paint at these locations is between 6-20% unsound: CS3.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

Span 1 - The ends of beams 1, 2, 4, 5 & 9 over the south abutment have failed paint with active corrosion extending outwards 6 to 12 inches with minor loss of section.

Span 2 - The ends of beams 7, 8 & 9 over pier 2 have failed paint with active corrosion.

Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #423: [2014] Gusset plate losses now noted in the through truss spans: Span 18 L2W inside plate loss along the horizontal shear zone is 50-65%; outside plate 33% (Photos 29-31); Span 18 L4W interior south plate loss horizontal shear zone of 36% (Photo 32); Span 18 L6W outside and inside plate horizontal shear loss of around 21% in isolated areas (Photo 33); Span 19 L12W inside plate horizontal shear loss 44%, outside plate horizontal shear loss 18% (Photo 34); Span 19 L17'W inside plate horizontal south shear loss 30%. The losses do not affect the current load rating, but are rated in CS4. Look for further section loss on gusset plates in the through truss during all subsequent inspections, as surface corrosion is prevalent on all and will start to corrode at an accelerated rate.

[2013] Span #23, West Truss, L0 over Pier #22 gusset plate has previously noted corrosion holes. There is a visible crack running through the holes along the base of the diagonal member. Mag particle testing performed on the area on 7-17-13 to assess the crack. Recommendation from Bridge CO was to drill an arresting hole at the top of the crack and not the bottom. Bottom not fully visible and may run through an existing repair. Work performed and area repainted the same day.

[2012] 35 gusset plates repaired/reinforced or analyzed structurally in 2010. Condition upgraded to CS3 from CS5 for those locations.

6/3/2010: See critical finding notes (JLZ). Gusset plate element was added in 2009. Fifteen gusset plates were repaired/reinforced in 2008. Design work was completed by WJE Engineers. The Winona and Rochester Bridge Crews reinforced all of the L0 and L8 gusset plates on the approach deck truss on both ends of the bridge. Several

additional gusset plates and lower chord sections were also reinforced. All of this work was completed per Bridge Office instructions.

ELEMENT #964: [2014] No critical findings during the 2014 routine and fracture critical inspection.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] No critical findings during the June 2012 Fracture Critical Inspection.

7/1/2010 - Critical gussets repaired. NBI upgraded from 2 to 3. No longer critical. Further repairs eventual.

6/24/2010: Span 22 L8W Ext-Int and Span 21 L0E gusset plates have 20%-40% loss in the horizontal shear zone.

Posting to remain at 40 tons. District to repair gussets the week of June 28, 2010.

Additional repair locations will be addressed as well.

6/3/2010: During a bridge rehab inspection, advanced section loss with areas of through corrosion were found at Sp16 L8W, Sp 21 L2W, Sp 21 L4W, Sp21 L4E, Sp24 L2W, and Sp24 L2E. Tom Styrbicki was contacted by Jennifer Zink onsite with findings. Yihong Gao performed detailed load rating analysis on the findings. Span 16 L8W exterior gusset plate controls the rating, and therefore is the first priority for repair. The bridge should be posted at legal loads, or 40 tons, and repairs to t Span 16 L8W panel point exterior plate per the 2008 Wiss, Janney, Elstner Associates, Inc. gusset plate repair plans should be made. Additional findings may occur during the scheduled bi-annual fracture critical inspection on June 21-25, 2010. The 40 ton posting should remain in effect till after the fracture critical inspection findings are determined. NBI Super changed to 3 (JLZ). Repairs made on 6/8/2010 to L8W on Span 16. NBI to remain a 3 until full bridge is assessed after the June 21-25 FC inspection.

6/2/08: See 2008 FC Inspection.

ELEMENT #966: [2014] No change in condition state required.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Fracture critical inspection completed in June 2012. All damaged or deteriorated fracture critical members identified have either been repaired in a previous year or structural analysis has determined that the member is stable for the anticipated loading (see elements 113, 121, and 423). Condition upgraded to CS2 from CS3.

6/3/2010: See Critical Finding notes (JLZ). The last fracture critical inspection was completed in June of 2010. As an outcome of this inspection, the Bridge Office will analyze numerous areas and advise the District on repair actions that will be required. Refer to the in-depth report for location of F/C members.

ELEMENT #967: [2014] No significant change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Distortions noted in previous inspections have either been reinforced, reviewed structurally, or have not changed. Condition state upgraded from CS4 to CS2.

[2010] Span 22U1E north free edge exhibits 1/2" distortion not due to pack rust or fit up. This distortion has increased from 1/8" - 1/4" as reported in 2009. The Bridge Office was made aware of this condition in 2010 and will analyze. Other areas of distortion exist along free edges due to pack rust and/or fit up. A number of compression zone areas are distorted outward on the deck truss gusset plates. Scattered gusset plates were reinforced by contract in 2008 and by the Winona and Rochester Bridge Crews in 2010.

Refer to the 2012 Fracture Critical Report for further details.

ELEMENT #981: [2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] All signs were in place at the time of this inspection.

ELEMENT #982: [2014] No change.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] All guardrail sections were intact at the time of this inspection. There are a few small impact dents and the galvanizing is starting to fail.

ELEMENT #984: [2014] No significant change; however, drain extensions should be considered in Spans 18-20 as corrosion to truss members has increased in deterioration mostly near the deck drains.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Approximately 1/3 of the deck drains are plugged, these are located at the Minnesota ends spans 1 through 15. There are scattered drains along the other spans that are plugged with dirt and debris. All of the deck drains and drain extension have failed paint with active corrosion. Drain extension were added along the Wisconsin deck truss in 2008.

ELEMENT #985: [2014] The north slope continues to erode which is causing movement/cracking in the North Abutment.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] The north slope is cemented over rocks. The north slope is breaking away and eroding. The slopes at the south abutment and all of the wingwalls are in stable condition at the time of this inspection.

ELEMENT #986: [2014] The sidewalk is settling at the approaches up to 1".

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012]The concrete sidewalk was replaced with a timber sidewalk under a contract in 2008. The timber decking portion of the sidewalk has scattered small drilled holes across the entire length, scattered cracks and splits along with a noted 1/2" wide x 6' long cracked area located in Span 22.

[Prior to 2008] There are numerous unsealed cracks, small spalls and delaminations along the curb faces on the downstream east side. Along the downstream east side of the bridge the spalled areas are located at Spans 5, 8, 14, 16 and 21.

ELEMENT #988: [2014] There are loose/broken conduit sheaths under the sidewalk in Spans 18-20.

[2013] No significant changes from the 2012 Fracture Critical Inspection.

[2012] Yes swallow nests, they are located in Spans 5 through 15 and 18 & 19.

There are retaining walls located at the south end of the bridge that have scattered vertical cracks with some staining.

The light poles were renumbered in 2010 starting from the Minnesota end.

Pole # 2 - Along the west side has a small dent located along the east side.

Pole # 4 - On the west side is cut on the east side of pole

Pole # 5 - Along the east side has 2 small dent along the west side located 6' up.

Pole # 6 - Along the west side has small dent along the east side located 4' up.

Pole # 7 - Along the east side has a 8" x 24" long dented area with a 1/2" x 3/4" hole located along the west side 3' up.

Pole # 8 - Along the west side has a 2" x 2 1/2" hole along the east side located 3' up.

Pole # 9 - Along the east side has a 4" x 8" dented area and a 1" diameter hole along the west side located 3' up.

Pole # 11 - Has been removed

Pole # 12 - Along the west side has a 4" x 6" dented area along the east side located 3' up.

General Notes:

Bridge 5900

NOTE: Fracture-critical inspection in 2014 by Jennifer Zink, Eric Evens, Joe Fishbein, Bill Nelson, Farrell Potter, Ken Rand, Scott Theisen and Gary Waletzki.

NOTE: Bridge was inspected in 2013 by Steven Miller, Robert Pyfferoen and Aaron Forthun.

NOTE: Bridge was inspected in 2011 By Eric Evens, Robert Pyfferoen, Steven Miller and Gary Waletzki

NOTE: Bridge was inspected in 2011 with snoopers truck by Eric Evens and Steven Miller.

This report was updated by Eric Evens on July 27, 2010.

NOTE: All spans, piers and floorbeams are numbered from the south (Minnesota end) and all beams, girders, bearings and columns are numbered from the west.

NOTE: Bridge was inspected using the snoopers in 2010.

NOTE: This structure has a scour code rating of "R" CRITICAL MONITOR. There are no scour monitoring signs mounted on the bridge.

NOTE: Underwater inspection was completed by Collins Engineering in 2008.

NOTE: All steel members were painted in 1986. The high truss spans 18 through 20 were painted in 1992 and 1993.

NOTE: In 2008, a contract was let to replace the concrete sidewalk with timber, selected gusset plates were reinforced and selected panel points were painted.

NOTE: Fracture critical inspection was completed by the Bridge Office in June of 2010. Pin assemblies were U T inspected in June of 2010. As an outcome of this inspection, the Bridge Office will analyze numerous areas and advise the District on repair actions that will be required.

NOTE: Refer to the attached Snooper Inspection Report for further details.

NOTE: Bridge was inspected in 2010 by Eric Evens, Robert Pyfferoen, Brian Haugen, Steve Miller and the Bridge Office Fracture Critical Section.

NOTE: The Winona and Rochester Bridge Crews reinforced all of the L0 and L8 gusset plates on the approach deck truss on both ends of the bridge. Several additional gusset plates and lower chord sections were also reinforced. All of this work was completed per Bridge Office instructions.

Channel - NBI 6 Refer to the underwater inspection report from Collins Engineering for this rating.

NOTE: On 9/28/2010 Brian Haugen per the request of Craig Falkum the District 6 structures engineer changed the NBI rating of the Superstructure from a three (3) to a four (4). The change was due to the repairs made after the 2010 in-depth fracture critical inspection was completed.

A report for 2011 was entered but had difficulty with interrogation with SIMS and D-6 inspection first year jitters.

[2012] 7 Day FC Report entered in SIMS on 10/3/2012 due to unavailability of report previously. Original 7 Day in Word format sent to owner on 6/27/2012.

Inventory Item Notes:

[2012] Review Wearing Surface Install Year and Depth as a surface type is listing in the inventory as Monolithic Concrete. MnDOT Scour Code Year is missing. The Mn/DOT Permit Codes are listed as No Restriction; however, the rating and posting letter dated June 9, 2010 recommended the bridge be posted at 40 tons with posting sign R12-5 which exclude all overweight permits and seasonal overweights.

NOTE: Underwater inspection performed in 2012 by Collins Engineering.

NBI-Channel rating was lowered to 5 due to results of underwater inspection report showing a scour hole, 20 feet in diameter and 5 to 8 feet deep, at the upstream nose of Pier 20. A 75 foot wide by 30 foot long scour depression was observed at the upstream nose of Pier 19. The depression was approximately 5 to 13 feet deep relative to the adjacent channel bottom. The entire north half of the footing at Pier 18 was exposed with 2 feet of vertical exposure at the NE corner, 1.0 foot of exposure at the midpoint, and 3.0 feet of vertical exposure at the NW corner. The footing was exposed around the entire perimeter of Pier 19. The seal was exposed from the downstream 1/4 point on the south face, around the upstream nose, to the mid-point on the north face. There was 3 feet of vertical undermining and 12 to 15 feet of penetration beneath the seal at the upstream end of the pier. There are five exposed timber piles beneath the seal of the pier. The footing was exposed around the upstream end and down to the midpoint on each side of Pier 20 with maximum vertical exposure of 5.5 feet (full height of footing). The seal was partially exposed at the upstream nose with a maximum vertical exposure of 3 feet. No foundation undermining was observed at Pier 20.

58. Deck NBI: [2014] No significant change. Updated the Unsound deck percentage as there is a lot of current and previous delaminations removed on the underside of the deck.
Changed to 5 in 2010 due to extensive cracking, leaching, and areas of under-deck delamination.
- 36A. Brdg Railings NBI:
- 36B. Transitions NBI:
- 36C. Appr Guardrail NBI:
- 36D. Appr Guardrail Terminal NBI:
59. Superstructure NBI: [2014] No significant change in respect to the NBI rating.
Changed to 4 in 2010 due to severe deterioration of steel truss members in both the main and deck truss spans with section loss over a range of 20-50%. Numerous repairs completed in 2010 as a result.
60. Substructure NBI: [2014] NBI dropped to 5 during this inspection due to the undermining of the river piers and the continued deterioration (cracking-spalls-patches) of the North Abutment due to erosion of the slope paving.
NBI of 6 since 1999.
61. Channel NBI: [2014] NBI rated down to 4 from 5 since 2012 due to the increased frequency at which the engineer recommended underwater inspections. Significant channel change has occurred since 2008. See 2012 underwater inspection report for details (attached to this report). As part of the rehabilitation study, scour monitoring and an underwater inspection is planned for this summer/fall. Countermeasures will be placed at the river pier footings in the fall. Once this is complete, the NBI may be upgraded to 5.
Changed to 6 in 2010 due to exposed pier footings and scour depressions as identified in the 2008 underwater inspection.
NBI rating lowered due to results of underwater inspection report showing a scour hole, 20 feet in diameter and 5 to 8 feet deep, at the upstream nose of Pier 20. A 75 foot wide by 30 foot long scour depression was observed at the upstream nose of Pier 19. The depression was approximately 5 to 13 feet deep relative to the adjacent channel bottom. The entire north half of the footing at Pier 18 was exposed with 2 feet of vertical exposure at the NE corner, 1.0 foot of exposure at the midpoint, and 3.0 feet of vertical exposure at the NW corner. The footing was exposed around the entire perimeter of Pier 19. The seal was exposed from the downstream 1/4 point on the south face, around the upstream nose, to the mid-point on the north face. There was 3 feet of vertical undermining and 12 to 15 feet of penetration beneath the seal at the upstream end of the pier. There are five exposed timber piles beneath the seal of the pier. The footing was exposed around the upstream end and down to the midpoint on each side of Pier 20 with maximum vertical exposure of 5.5 feet (full height of footing). The seal was partially exposed at the upstream nose with a maximum vertical exposure of 3 feet. No foundation undermining was observed at Pier 20.
62. Culvert NBI:

71. Waterway Adeq NBI:

72. Appr Roadway Alignment NBI:

Pictures



Photo 1 - Span 19 Stringer 1 Web Through Corrosion at L12W



Photo 2 - Span 19 Stringer 1 Web Through Corrosion at L12W

Pictures



Photo 3 - Span 18 Stringer 1 at L8W Through Corrosion



Photo 4 - Span 18 Stringer 1 at L8W Bottom Flange Losses

Pictures



Photo 5 - Span 18 Stringer 1 at L8W Connection West Face



Photo 6 - Span 18 Stringer 6 Cope Through Corrosion at L8E

Pictures



Photo 7 - Span 19 Stringer 1 Corrosion at FB11



Photo 8 - Span 19 Stringer 2 Through Corrosion at FB11

Pictures



Photo 9 - Span 19 Stringers 18'-17'



Photo 10 - Span 19 Stringer 5 at L18'E

Pictures



Photo 11 - Span 19 FB19 Stringer 1 Bottom Flange Losses



Photo 12 - Span 19 Stringer 1 at L19NW

Pictures



Photo 13 - Span 19 Stringer 7 at L18'E



Photo 14 - Span 19 L17-L18E

Pictures



Photo 15 - Span 19 L17-L18E Looking North



Photo 16 - Span 19 L17-L18E Looking North

Pictures



Photo 17 - Span 19 L17-L18E Looking North



Photo 18 - Span 19 L12'E Interior Chord Shelf Plate Typical

Pictures



Photo 19 - Span 19 L15-L16E Losses



Photo 20 - Span 19 L15-L16E Losses

Pictures



Photo 21 - Span19 L12'W-L13'W UT Readings of Chord SL Inner



Photo 22 - Span19 L12'W-L13'W TYP Interior Web Pitting & PR

Pictures



Photo 23 - Span19 L12'W-L13'W TYP Interior Web Pitting & PR



Photo 24 - Span 18 FB2 Extensive Corrosion at L2E South

Pictures



Photo 25 - Span 19 FB16'NW



Photo 26 - Span 19 FB12SW Web Losses

Pictures



Photo 27 - Span 18 FB6 Extensive Surface Corrosion



Photo 28 - Span 19 FB17 Bottom Flange Corrosion

Pictures



Photo 29 - Span 18 L2W Exterior Plate Corrosion Losses



Photo 30 - Span 18 L2W Batten Between Plates North Through Corrosion

Pictures



Photo 31 - Span 18 L2W Interior Plate North Horizontal Shear Losses



Photo 32 - Span 18 L4W Inside Plate South Corrosion

Pictures



Photo 33 - Span 18 L6W Inside Interior Plate South Losses



Photo 34 - Span 19 L12W Interior Plate North

Pictures



Photo 35 - Span23 L0E Shifted Bearing Pad



Photo 36 - North Abutment Crack Under Stringer 5

5900 UW REPORT - 2012

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 5900
TRUNK HIGHWAY NO. 43
OVER THE
MISSISSIPPI RIVER
DISTRICT 6 – WINONA COUNTY



AUGUST 15 & 16, 2012
AND
SEPTEMBER 20, 2012
PREPARED FOR THE
MINNESOTA DEPARTMENT OF TRANSPORTATION
BY
COLLINS ENGINEERS, INC.

JOB NO. 7423

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 5900, Piers 18 through 21, were found to be generally in good to satisfactory condition, but with a significant extent of localized scour and general channel degradation present. The concrete of all piers exhibited only minor deterioration including random vertical and horizontal hairline cracks, light to moderate scaling, and minor section loss with no reinforcing steel exposed. The footing at Pier 18 was partially exposed with a maximum vertical exposure of 3 feet. The footing and seal were exposed at Piers 19 and 20 with a maximum 3 feet of seal exposure at Pier 20 and a full height of seal exposure at Pier 19. Additionally, foundation undermining was observed at the upstream end of Pier 19 with the undermining cavity measuring approximately 3 feet high and up to 12 to 15 feet of horizontal penetration beneath the seal of the pier. The dive inspector observed five exposed timber piles beneath Pier 19. The extent of the above mentioned foundation exposure/undermining at Piers 19 and 20 has increased significantly since the previous underwater inspection conducted in 2008, and the channel bottom at those piers currently exhibited 3 to 13 feet of degradation and/or localized scour as compared to the findings of the previous inspection.

Due to the present extent of foundation exposure, underwater scanning was performed at Pier 19 utilizing acoustic imaging with 3D multi-beam sonar system. Refer to Acoustic Images 1 and 2 within the report for details.

INSPECTION FINDINGS:

- (A) The channel bottom material around Pier 18 consisted of rock and riprap up to 2 feet in diameter.
- (B) The channel bottom material around Piers 19 and 20 consisted of sand allowing 6 inches of probe rod penetration, along with randomly scattered cobbles.

- (C) Scour hole, 20 feet in diameter and 5 to 8 feet deep, was present at the upstream nose of Pier 20. A 75 foot wide by 30 foot long scour depression was observed at the upstream nose of Pier 19. The depression was approximately 5 to 13 feet deep relative to the adjacent channel bottom.
- (D) Entire north half of the footing at Pier 18 was exposed with 2 feet of vertical exposure at the northeast (downstream) corner, 1.0 foot of exposure at the midpoint, and 3.0 feet of vertical exposure at the northwest (upstream) corner.
- (E) The footing was exposed around the entire perimeter of Pier 19. The seal was exposed from the downstream 1/4 point on the south face, around the upstream nose, to the mid-point on the north face. There was 3 feet of vertical undermining and 12 to 15 feet of penetration beneath the seal at the upstream end of the pier. The dive inspector observed five exposed timber piles beneath the seal of the pier. Refer to Acoustic Images 1 and 2.
- (F) The footing was exposed around the upstream end and down to the midpoint on each side of Pier 20 with maximum vertical exposure of 5.5 feet (full height of footing). The seal was partially exposed at the upstream nose with a maximum vertical exposure of 3 feet. No foundation undermining was observed at Pier 20.
- (G) At the northeasterly 1/4 point of Pier 18, the upstream nose of Pier 19, and the downstream nose of Pier 20, the concrete shaft encasements had random hairline vertical cracks that extended through the entire encasement height with random horizontal hairline cracks extending between the vertical cracks from 3 to 5 feet above the waterline.
- (H) There was a 3 foot long by 6 inch high area of section loss with a maximum of 3 inches of penetration at the waterline across the upstream nose of Pier 18.
- (I) Minor scaling with up to 1/2 inch penetration was observed from 2 feet above the waterline to the channel bottom around the upstream column of Pier 21.

RECOMMENDATIONS:

- (A) Since the extent of scour and general channel degradation at the bridge has increased significantly since the previous inspection and given that this has lead to one of the piers becoming undermined, it is recommended that scour countermeasures be installed at Piers 19 and 20.

- (B) Due to the above mention increase in foundation exposure and undermining at the bridge, it is recommended that an underwater inspection be performed within a reduced interval of twenty four (24) months and following any extreme weather event resulting in flooding, high water, or turbulent flow in the vicinity of the structure.

- (C) Once the scour countermeasures are installed, reinspect the submerged substructure units soon after and then at the normal maximum recommended (NBIS) interval of sixty (60) months.

Inspection Team Leader



Roy A. Forsyth, PE
Date 6/30/2014 License# 49270

Respectfully submitted,

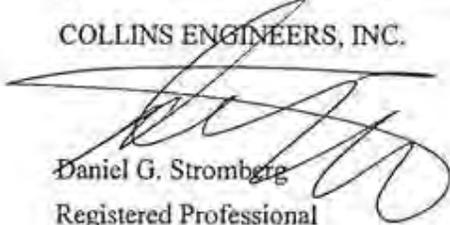
PROFESSIONAL ENGINEER

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Daniel G. Stromberg

Date 6/30/14 License # 21491

COLLINS ENGINEERS, INC.



Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 5900

Feature Crossed: Mississippi River

Feature Carried: Trunk Highway No. 43

Location: District 6 – Winona County

Bridge Description: The superstructure consists of multiple steel truss spans supported by two reinforced concrete abutments and multiple reinforced concrete piers. The piers are numbered starting from the south end of the bridge.

2. INSPECTION DATA

Professional Engineer/Team Leader: Roy A. Forsyth, P.E.

Dive Team: Jordan Furlan, P.E., Charles Euwema

Date: August 15 & 16, 2012 and September 20, 2012

Weather Conditions: Party Cloudy, 63° F

Underwater Visibility: 2.0 feet

Waterway Velocity: 0.5 ft/s

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 18 through 21

General Shape: Piers 18 through 20 each consist of two square reinforced concrete columns, which sit on a common shelf that is partially encased in concrete around the waterline (repair) and founded on a rectangular concrete footing with driven timber piles. Pier 21 consists of two square reinforced concrete columns connected by a horizontal concrete strut and founded on individual square concrete footings and driven timber piles.

Maximum Water Depth at Substructure Inspected: Approximately 26.4 feet.

4. WATERLINE DATUM

Water Level Reference: The top of pedestal at upstream end of Pier 21.

Water Surface: The waterline was approximately 4.5 feet below reference.

Waterline Elevation = 645.5

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 5

Item 92B: Underwater Inspection: Code B/08/12

Item 113: Scour Critical Bridges: Code R/04

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

X Yes _____ No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
205	Reinforced Concrete Column	2	EA		2			
210	Reinforced Concrete Pier Wall	210	LF		210			
220	Reinforced Concrete Footing	3	EA		3			
361	Scour Smart Flag	1	EA			1		
985	Slopes and Slope Protection	2	EA	1	1			



Photograph 1. Overall View of the Structure, Looking East.



Photograph 2. View of Pier 18, Looking Southeast.



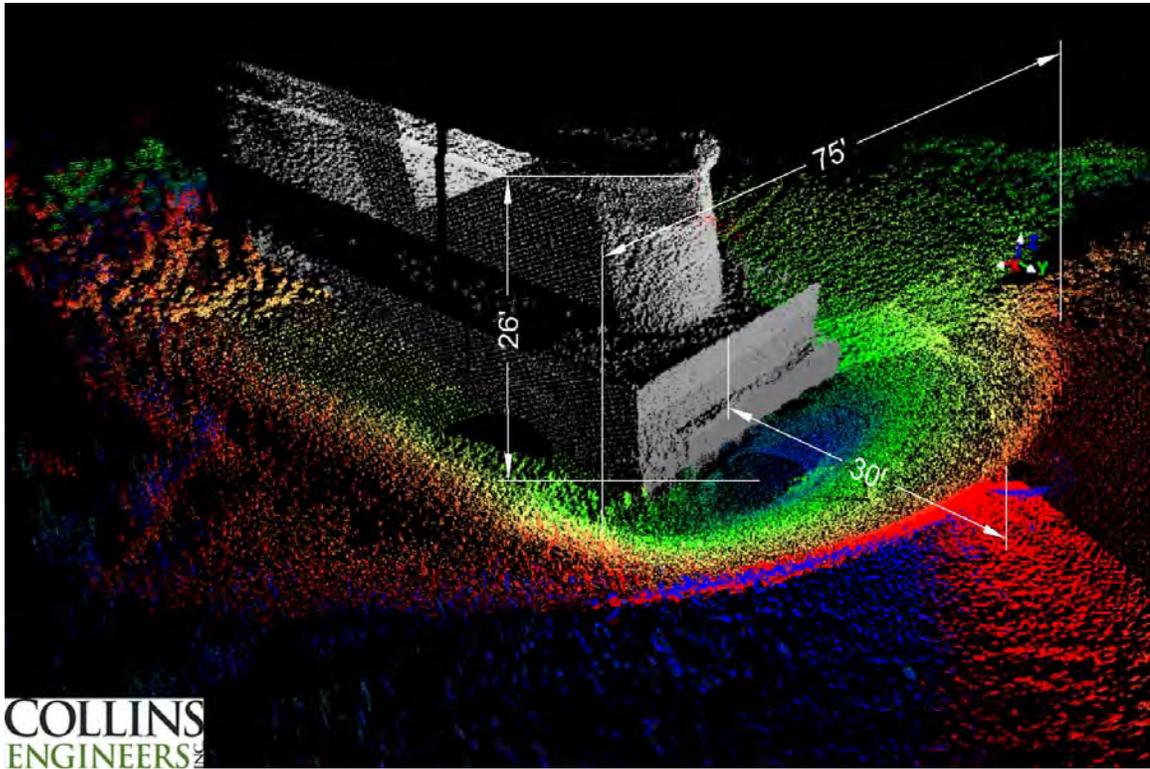
Photograph 3. View of Pier 19, Looking North.



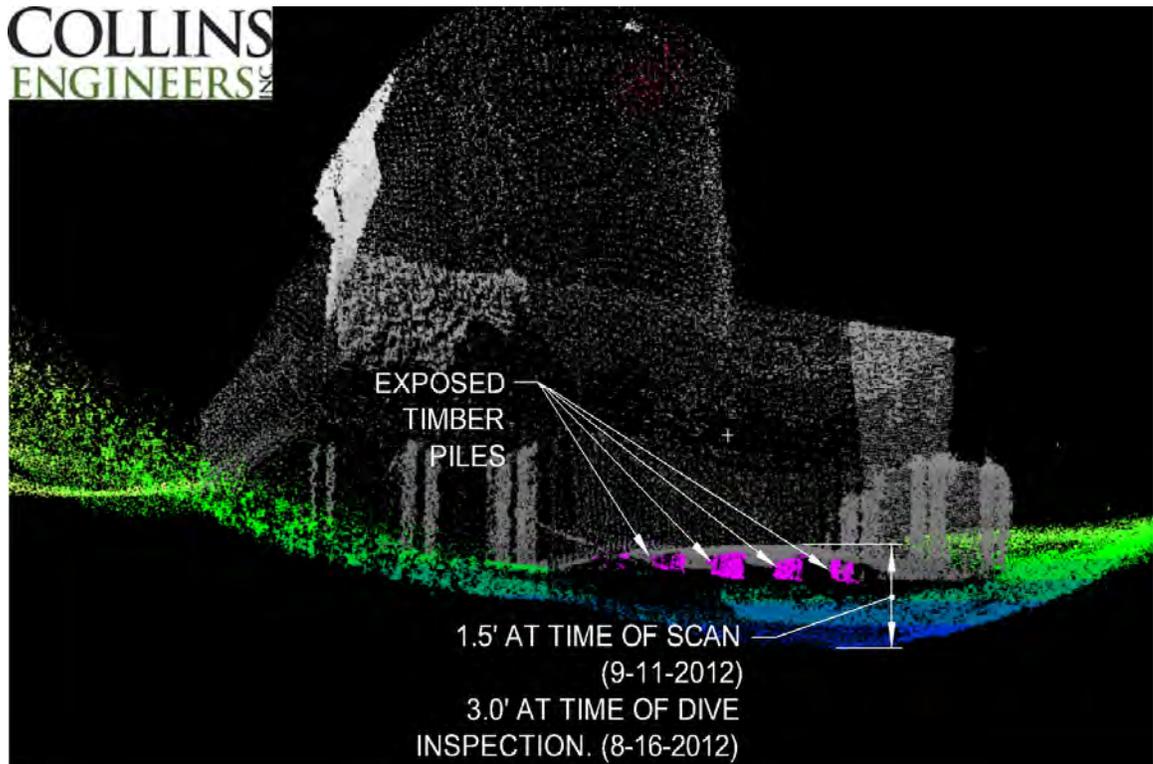
Photograph 4. View of Pier 20, Looking North.



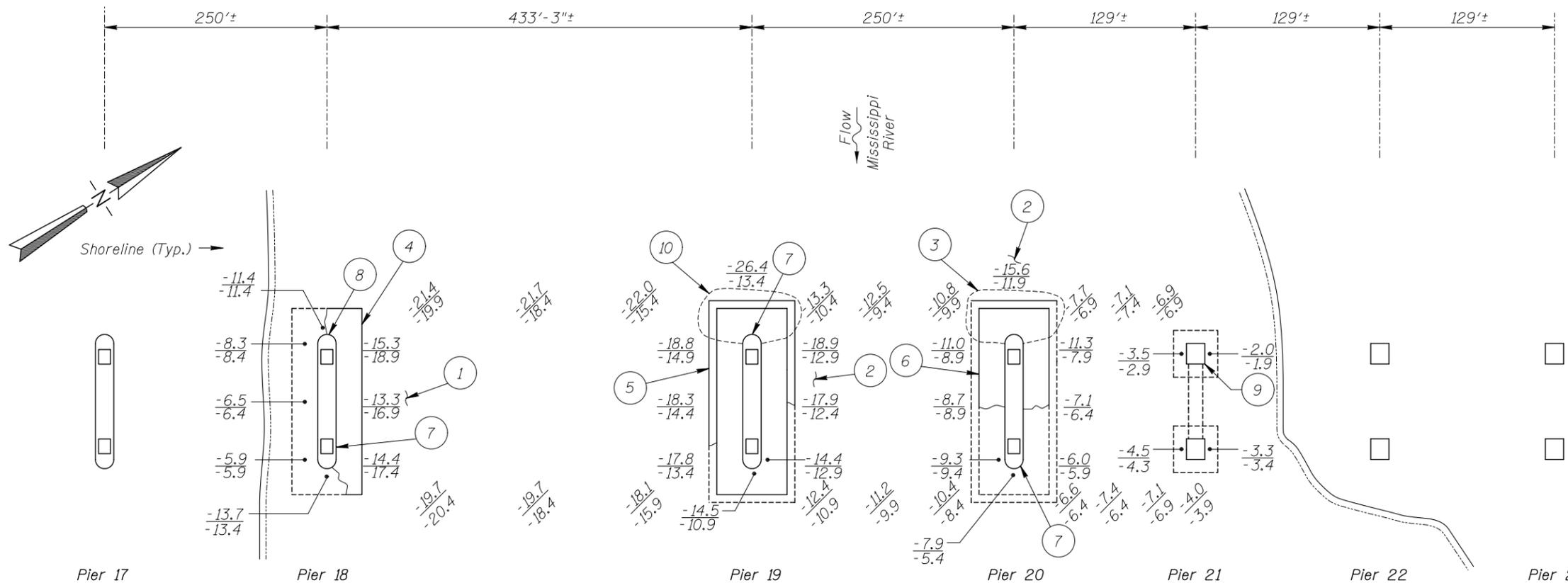
Photograph 5. View of Pier 21, Looking North.



Acoustic Image 1. Scour depression at upstream nose of Pier 19, Looking South.



Acoustic Image 2. Undermined seal with exposed timber piles at the upstream nose of Pier 19, Looking South.



SOUNDING PLAN

INSPECTION NOTES:

- 1 The channel bottom material around Pier 18 consisted of rock and riprap up to 2 feet in diameter.
- 2 The channel bottom material around Piers 19 and 20 consisted of sand allowing 6 inches of probe rod penetration, along with randomly scattered cobbles.
- 3 Scour hole, 20 feet in diameter and 5 to 8 feet deep, was present at the upstream nose of Pier 20.
- 4 Entire north half of the footing at Pier 18 was exposed with 2 feet of vertical exposure at the northeast (downstream) corner, 1 foot of exposure at the midpoint, and 3 feet of vertical exposure at the northwest (upstream) corner.
- 5 The footing was exposed around the entire perimeter of the pier a maximum of 5.5 feet (full height) vertically. The seal was exposed from the downstream 1/4-point on the south face, around the upstream nose, to the mid-point on the north face. There was 3 feet of vertical undermining and 12 to 15 feet of penetration beneath the seal at the upstream nose. The dive inspector observed five timber exposed piles (as a result of the undermining) beneath Pier 19 that were in good condition.
- 6 The footing was exposed around the upstream end and down to the midpoint on each side of Pier 20 with maximum vertical exposure of 5.5 feet (full height of footing). The seal was partially exposed at the upstream end only with a maximum vertical exposure of 3 feet.
- 7 At the northeasterly 1/4 point of Pier 18, the upstream nose of Pier 19, and the downstream nose of Pier 20, the concrete shaft encasements had random hairline vertical cracks that extended through the entire encasement height with random horizontal hairline cracks extending between the vertical cracks from 3 to 5 feet above the waterline.
- 8 There was a 3 foot long by 6 inch high area of section loss with a maximum of 3 inches of penetration at the waterline across the upstream nose of Pier 18.
- 9 Minor scaling with up to 1/2 inch penetration was observed from 2 feet above the waterline to the channel bottom around the upstream column of Pier 21.
- 10

GENERAL NOTES:

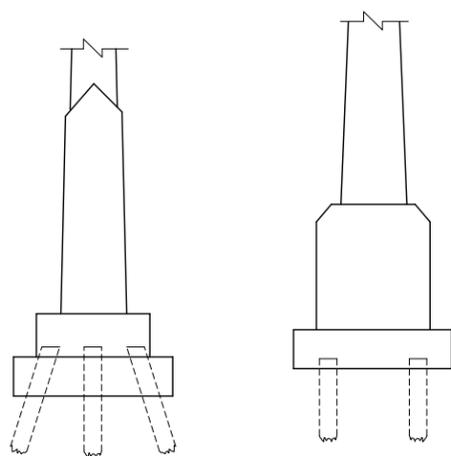
1. Piers 18 through 21 were inspected underwater.
2. At the time of inspection on August 16, 2012 the waterline was located approximately 4.5 feet below the top of the pedestal at the upstream end of Pier 21. This corresponds with a waterline elevation of 645.5 feet based on previous report dated October, 17 2008.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.
5. Underwater acoustic imaging, utilizing a mechanical scanning 3D multi-beam sonar system, was conducted on September 20, 2012.

Note:

All soundings based on 2012 waterline location

Legend

- 13.5 Sounding Depth from Waterline (8/16/12)
- 13.3 Sounding Depth from Waterline (10/17/08)

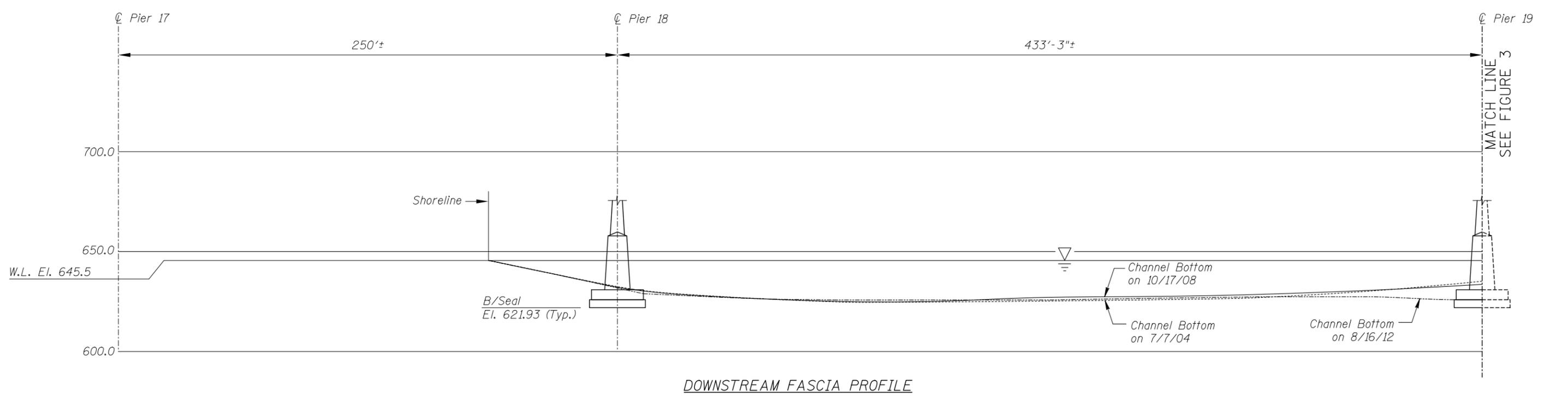
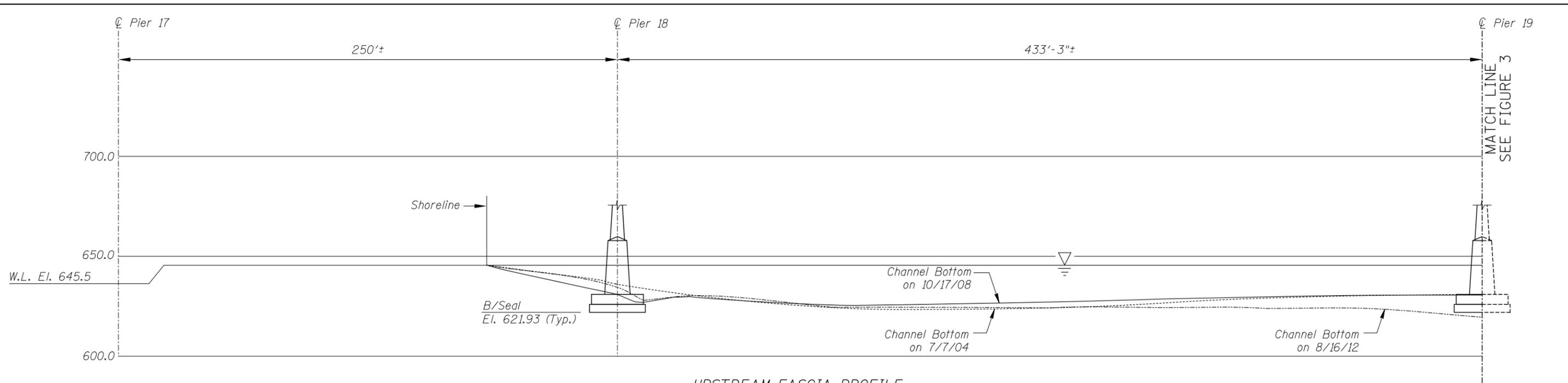


Piers 18, 19, and 20

Pier 21

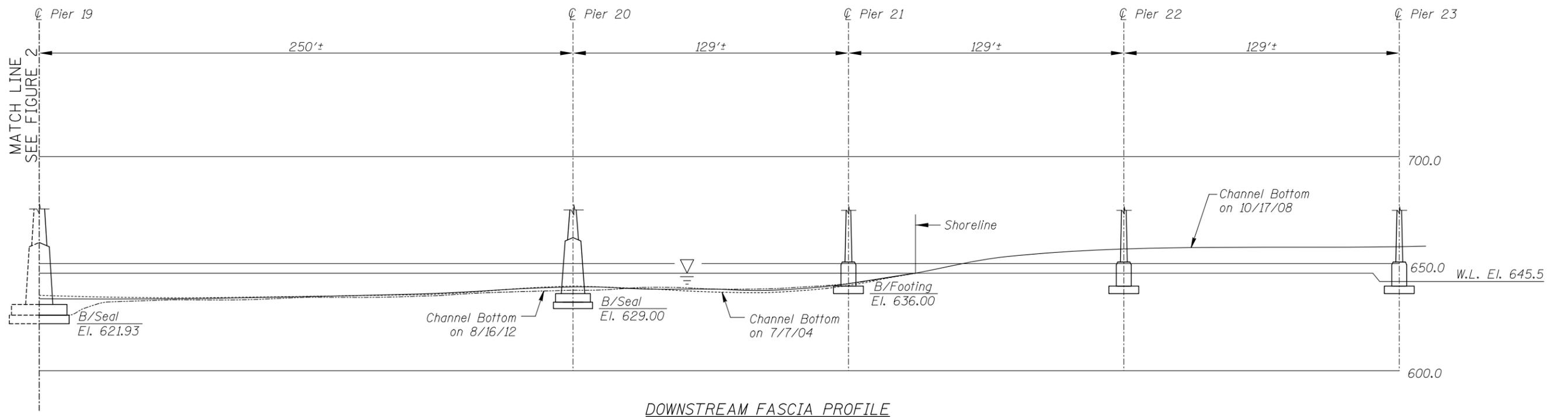
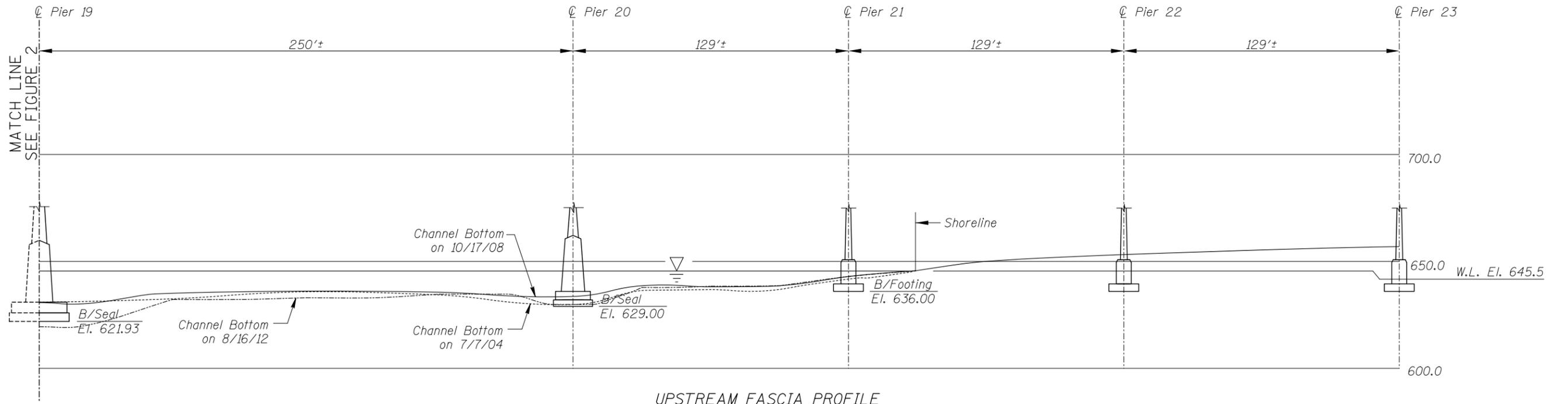
TYPICAL END VIEW OF PIERS

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 5900 OVER THE MISSISSIPPI RIVER DISTRICT 6, WINONA COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: JTF	COLLINS ENGINEERS	Date: AUG. 2012
Checked By: DGS	<small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: NTS
Code: 54735900		Figure No.: 1



Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 5900 OVER THE MISSISSIPPI RIVER DISTRICT 6, WINONA COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: JTF	COLLINS ENGINEERS <small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUG. 2012
Checked By: DGS		Scale: 1"=50'
Code: 54735900		Figure No.: 2



Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 5900 OVER THE MISSISSIPPI RIVER DISTRICT 6, WINONA COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: JTF	COLLINS ENGINEERS	Date: AUG. 2012
Checked By: DGS		Scale: 1"=50'
Code: 54735900		Figure No.: 3

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 15 & 16, 2012
ON-SITE TEAM LEADER: Roy A Forsyth, P.E.
BRIDGE NO: 5900 WEATHER: Partly Cloudy, 63° F
WATERWAY CROSSED: Mississippi River
DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR
_____ OTHER _____
PERSONNEL: Jordan Furlan, P.E., Charles Euwema
EQUIPMENT: Commercial Scuba, 20' Boat w/motor, Camera, Fathometer, Lead Line
TIME IN WATER: 11:55 A.M.
TIME OUT OF WATER: 12:55 P.M.
WATERWAY DATA: VELOCITY 0.5 ft/s
VISIBILITY 2.0 feet
DEPTH 26.4 feet at Pier 19, 21.6 feet maximum in channel
ELEMENTS INSPECTED: Piers 18 through 21
REMARKS: Overall, the concrete of all piers was generally in satisfactory condition with minor scaling at the upstream column of Pier 21 and random hairline cracks at downstream nose of Piers 18 and 20 and upstream nose of Pier 19. In addition, an area of concrete section loss with 3 inch maximum penetration was present at the upstream nose of Pier 18. The footing at Pier 18 was exposed with a maximum vertical exposure of 3 feet. Scour depressions, 5 to 13 feet deep, were present at the upstream noses of Piers 19 and 20. The footings and seal were exposed at Piers 19 and 20 with a maximum of 3 feet of seal exposure at Pier 20 and full height seal exposure with undermining at Pier 19. The undermining cavity measured up to 3 feet vertically with 12 to 15 feet of penetration beneath the pier. The dive inspector observed five exposed timber piles beneath Pier 19 that were in good condition. The channel bottom material consisted of up to 2 foot diameter rock and riprap around Pier 18 and sand allowing 6 inches of probe rod penetration with randomly scattered cobbles around the perimeter of Piers 19 and 20.

FURTHER ACTION NEEDED: X YES NO

Since the extent of scour and general channel degradation at the bridge has increased significantly since the previous inspection and given that this has lead to one of the piers becoming undermined, it is recommended that scour countermeasures be installed at Piers 19 and 20.

Due to the above mention increase in foundation exposure and undermining at the bridge, it is recommended that an underwater inspection be performed within a reduced interval of twenty four (24) months and following any extreme weather event resulting in flooding, high water, or turbulent flow in the vicinity of the structure.

Once the scour countermeasures are installed, reinspect the submerged substructure units soon after and then at the normal maximum recommended (NBIS) interval of sixty (60) months.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 5900
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER, Roy A. Forsyth, P.E.
 WATERWAY CROSSED Mississippi River

INSPECTION DATE August 15 & 16, 2012, September 20, 2012

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

UNIT REFERENCE NO.	UNIT DESCRIPTION	MAXIMUM DEPTH OF WATER	SUBSTRUCTURE					CHANNEL					GENERAL						
			PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Pier 18	15.3'	N	7	6	8	N	7	7	8	8	N	7	7	N	N	6	N	N
	Pier 19	26.4'	7	7	6	8	N	6	4	N	N	N	5	7	N	N	7	N	N
	Pier 20	15.6'	N	7	6	8	N	6	5	N	N	N	5	7	N	N	7	N	N
	Pier 21	4.5'	N	7	N	8	N	7	6	7	7	N	6	7	N	N	7	N	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete of all piers was generally in satisfactory condition with minor scaling at the upstream column of Pier 21 and random hairline cracks at downstream nose of Piers 18 and 20 and upstream nose of Pier 19. In addition, an area of concrete section loss with 3 inch maximum penetration was present at the upstream nose of Pier 18. The footing at Pier 18 was exposed with a maximum vertical exposure of 3 feet. Scour depressions, 5 to 13 feet deep, were present at the upstream noses of Piers 19 and 20. The footings and seal were exposed at Piers 19 and 20 with a maximum of 3 feet of seal exposure at Pier 20 and full height seal exposure with undermining at Pier 19. The undermining cavity measured up to 3 feet vertically with 12 to 15 feet of penetration beneath the pier. The dive inspector observed five exposed timber piles beneath Pier 19 that were in good condition. The channel bottom material consisted of up to 2 foot diameter rock and riprap around Pier 18 and sand allowing 6 inches of probe rod penetration with randomly scattered cobbles around the perimeter of Piers 19 and 20.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO. USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.

Structural Assessment Report - FC



BRIDGE STRUCTURAL ASSESSMENT REPORT

PURPOSE:

This report is a structural assessment of the structure and its ability to carry loads based on conditions identified in the attached bridge inspection report. The assessment is only a cursory review intended to provide guidance as to the relative hazards for structural conditions and deficiencies identified. This report is mandatory for all fracture critical bridges and is completed by the MnDOT Bridge Office upon receipt of the 7 Day FC Report; however, it is an OPTIONAL tool for agencies to utilize at their discretion for all other inspection types.

BRIDGE NO.: 5900	BRIDGE OWNER: State Highway Agency
DATE INSPECTED: 06/05/2014	STRUCTURE TYPE: Steel Continuous Truss - Thru
FACILITY CARRIED: TH 43	FEATURES INTERSECTED: MISS RVR, RR, STREETS
TYPE OF INSPECTION: <input type="checkbox"/> ROUTINE <input checked="" type="checkbox"/> FRACTURE CRITICAL <input type="checkbox"/> PINNED ASSEMBLY: <input type="checkbox"/> SPECIAL: <input type="checkbox"/> DAMAGE: <input type="checkbox"/> OTHER:	
<u>Check all that apply:</u>	
Redundancy: <input type="checkbox"/> Load Path <input type="checkbox"/> Structural <input type="checkbox"/> Internal	Connection Type: <input checked="" type="checkbox"/> Riveted <input checked="" type="checkbox"/> Bolted <input checked="" type="checkbox"/> Welded <input type="checkbox"/> Other:

1. Was a critical finding identified during this inspection or upon structural review? Yes No
 - a) If selected "Yes" above, state briefly the finding(s):

2. If a critical finding was identified, what is the current status? Pending
 Resolved
 N/A
 - a) Briefly state actions taken:

3. Does the condition of any bridge component indicate impaired function? Examples of bridge components with impaired function include elements that are: frozen or immovable, out-of-plumb or misaligned, distorted or structurally deformed, excessively deteriorated, cracked, broken, eroded or scoured. Yes No

a) If selected "Yes" above, state briefly the component(s) and condition(s):

4. Does the overall condition of the bridge, or any of its components mentioned in Question 3, suggest the need for detailed structural analysis and/or a revised load rating? Yes No

a) If selected "Yes", state the reason for this recommendation and indicate a proposed timeframe in accordance with State of Minnesota Rule 8810.9500 (Subpart 2):

5. Based on the structural assessment of these findings, recommendations include:

- Repair/Maintenance Monitoring Plan
 Other Increased Inspection Frequency

Explain recommended actions:

Continue monitoring corrosion condition of gusset plates, batten plates, lacing bars of the bottom chord of the main through trusses. Report to the Bridge Office immediately during each inspection if additional section losses are incurred.

Continue monitoring the heavily corroded floor beams, especially at panel point connections.

Continue monitoring the indication and wearing of all pins.

Continue measuring the movement of all bearings and the creeping of bearing pads and, if necessary, reposition the bearing pads.

Continue monitoring the paint condition and, if necessary, partially re-paint severely failed paint areas.

Continue monitoring the tilting of piers, especially Piers 19 and 20.

6. Other comments:

Continue monitoring the scouring condition.

Bridge Office Reviewer Jihshya J. Lin
8/9/2014

**MINNESOTA DEPARTMENT OF TRANSPORTATION
NBI CONDITION CODE AND APPRAISAL RATING HISTORY**

BRIDGE 5900

03/03/2016

PAGE: 1

YEAR BUILT 1941

BR NO	BR NO	FACILITY CARRIED	FEATURE CROSSED	MAIN SPAN TYPE	INSP DATE	D	C	C	E	G	U	A	DEF	SUFF	FHWA STATUS			
						E	S	S	U	H	V	E				C	H	P
						C	U	U	L	A	A	O	L	2	P	STAT	RTG	
5900		TH 43	MISS RVR, RR, STREETS	CSTL HIGH TRUSS	04/30/1992	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					04/28/1993	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					04/26/1994	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					05/30/1995	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					05/07/1996	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					07/01/1996	X	X	X	X	X	5	4	0	8	8	F.O.		OPEN
					06/10/1997	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					06/09/1998	6	5	5	N	8	5	4	0	8	8	F.O.		OPEN
					12/12/1998	X	X	X	X	X	5	4	0	8	8	F.O.		OPEN
					12/13/1998	X	X	X	X	X	5	4	0	8	8	F.O.		OPEN
					12/31/1998	X	X	X	X	X	5	4	0	8	8	F.O.		OPEN
					04/21/1999	6	5	6	N	8	5	4	0	8	8	F.O.		OPEN
					04/04/2000	6	5	6	N	8	5	4	0	8	8	F.O.	45.8	OPEN
					04/28/2002	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					10/06/2003	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					04/28/2004	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					04/29/2004	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					04/18/2005	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					06/12/2006	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					04/16/2007	6	5	6	N	8	5	4	4	8	8	ADEQ	49.8	OPEN
					06/02/2008	6	5	6	N	8	4	4	4	8	8	ADEQ	39.7	OPEN
					05/14/2009	6	5	6	N	8	4	4	4	8	8	ADEQ	39.7	OPEN
					05/20/2010	5	4	6	N	6	4	4	2	8	6	S.D.	24.3	LOAD POSTED
					06/20/2012	5	4	6	N	5	4	4	2	8	6	S.D.	24.3	LOAD POSTED
					06/10/2013	5	4	5	N	4	4	4	3	8	6	S.D.	24.3	LOAD POSTED
					06/05/2014	5	4	5	N	4	4	4	2	8	6	S.D.	24.3	LOAD POSTED
					06/10/2015	5	4	5	N	4	4	4	2	8	6	S.D.	24.3	LOAD POSTED

27 INSPECTIONS